ELECTRICAL CONSTRUCTION AND MAINTENANCE

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JAN 1949

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A McGRAW-HILL PUBLICATION

Look for this tag—

when you buy fluorescent fixtures

This tag identifies a fluorescent fixture equipped with a G-E ballast. Look for it. It means that the manufacturer has utilized the advantages of the industry's finest ballast to assure rated lamp life and light output . . . quiet and trouble-free operation.

General Electric ballasts are lamp-matched. They are designed, built, and tested to get the most out of standard fluorescent lamps—to give you the kind of lighting you are looking for. ***Apparatus Dept., General Electric Company, Schenectady 5, N. Y.***

FLUORESCENT LAMPS, unlike incandescent lamps, do not draw current directly from the lighting circuit. Instead they draw their current through a special transformer or ballast mounted in the fluorescent fixture.

With fluorescent lighting, therefore, the amount of the light you get from the lamp, the life of the lamp and, to some extent the life and efficiency of the fixture itself, depend to a large measure on the characteristics of the ballast. Good ballasts mean better lighting.

GENERAL ELECTRIC

412-63

NOW Murray GIVES you REVERSIBLE JAWS

IN SOCKET METER CASES — *for* VERTICAL *or* HORIZONTAL MOUNTING

THIS newest Murray feature—and the pictures show how simple it is—vastly increases the use of these socket meter cases, drawn of 3 So aluminum. The speed with which the reversal can be made, commends it to all electricians; and the fact that the same case does equally well for vertically or horizontally mounted meters, reduces the stock which dealers must carry.

HOW the heavy HUB is permanently SEALED in!

THE hex end of the hub fits a hex hole in the flattened part of the case, preventing turning. A close-fitting hex washer goes over the hub and rests against the case. By ingenious mechanical means, the protruding hex head is flared over the washer, making a permanent, turn-proof, water-tight seal.

Send for Bulletin 503

another Murray specialty—

MURRAY MANUFACTURING CORPORATION · 1250 Atlantic Avenue, Brooklyn 16, New York

BETTER LIGHT *for the Eyes of Industry*

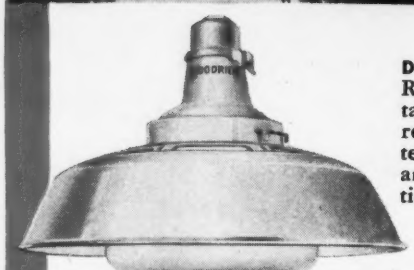
APPLETON "GOODRICH" STOCKLITE — [illegible] to adequately [illegible] shelves and bin[illegible] over stock aisles.

Appleton Lighting Equipment

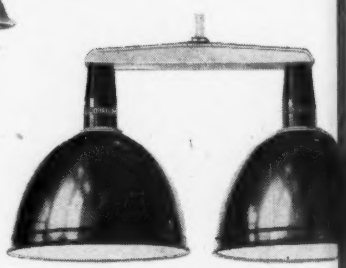
Depend on Appleton Lighting Equipment for the illuminating efficiency that spells better industrial workmanship, smoother production. Make every industrial job you plan a model of better lighting by specifying Appleton fixtures, expertly engineered for superior illumination, lower maintenance.

The Appleton "Goodrich" Stocklite shown above is typical. Diffusing light from eight different reflecting surfaces, the Stocklite provides the proper distribution of light in narrow stock aisles, without spotty distribution or unpleasant glare.

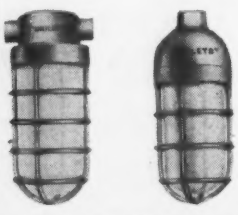
Hundreds of lighting specialties of equally expert design comprise the *complete* Appleton Line of ruggedly built fixtures, meeting virtually every industrial requirement — indoors or out. Now including the famous line of lighting specialties formerly manufactured by the Goodrich Electric Company, Appleton Lighting Equipment points the way to better lighting at minimum service, installation and operating cost.



DISKONECT GLASSTEEL DIFFUSE Reflector, lamp and globe may be [illegible] tached from hood as unit, wit[illegible] rewiring. Provides soft, yet high[illegible] tensity illumination on both horizo[illegible] and vertical surfaces without ob[illegible] tionable shadows.



TWIN-HIGHLITE HIGH-MOUNTING FIXTURES—Designed to produce high levels of illumination from a minimum number of outlets in high bay industrial interiors. Easily serviced. Equipped with easy-to-wire channel for mounting on single suspension. Porcelain-enameled.



APPLETON VAPOR-TIGHT FIXTURES — Newly designed. Made of tough malle[illegible] iron. Also available in the *complete* Appl[illegible] Line are Explosion-Proof and Dust-T[illegible] Lighting Fixtures, blanketing all requ[illegible] ments for hazardous locations.

USE THE BIG APPLETON CATALOG—for convenient purchasing of all electrical equipment. This big buying guide is a fully detailed and graphically illustrated listing of the more than 15,000 items in the Appleton Line — all "STANDARD FOR BETTER WIRING." The Appleton Catalog will be mailed to any user of wiring and lighting equipment immediately upon request.

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APPLETON

CONDUIT FITTINGS • LIGHTING EQUIPMENT • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • REEL[illegible]

ELECTRICAL CONSTRUCTION AND MAINTENANCE

With which is consolidated Electrical Contracting, The Electragist and Electrical Record . . . Established 1901

A practical technical and management journal for electrical contractors, industrial electricians, inspectors, engineers and motor shops, covering engineering installations, repairing, maintenance and management, in the field of electrical construction and maintenance.

January • 1949

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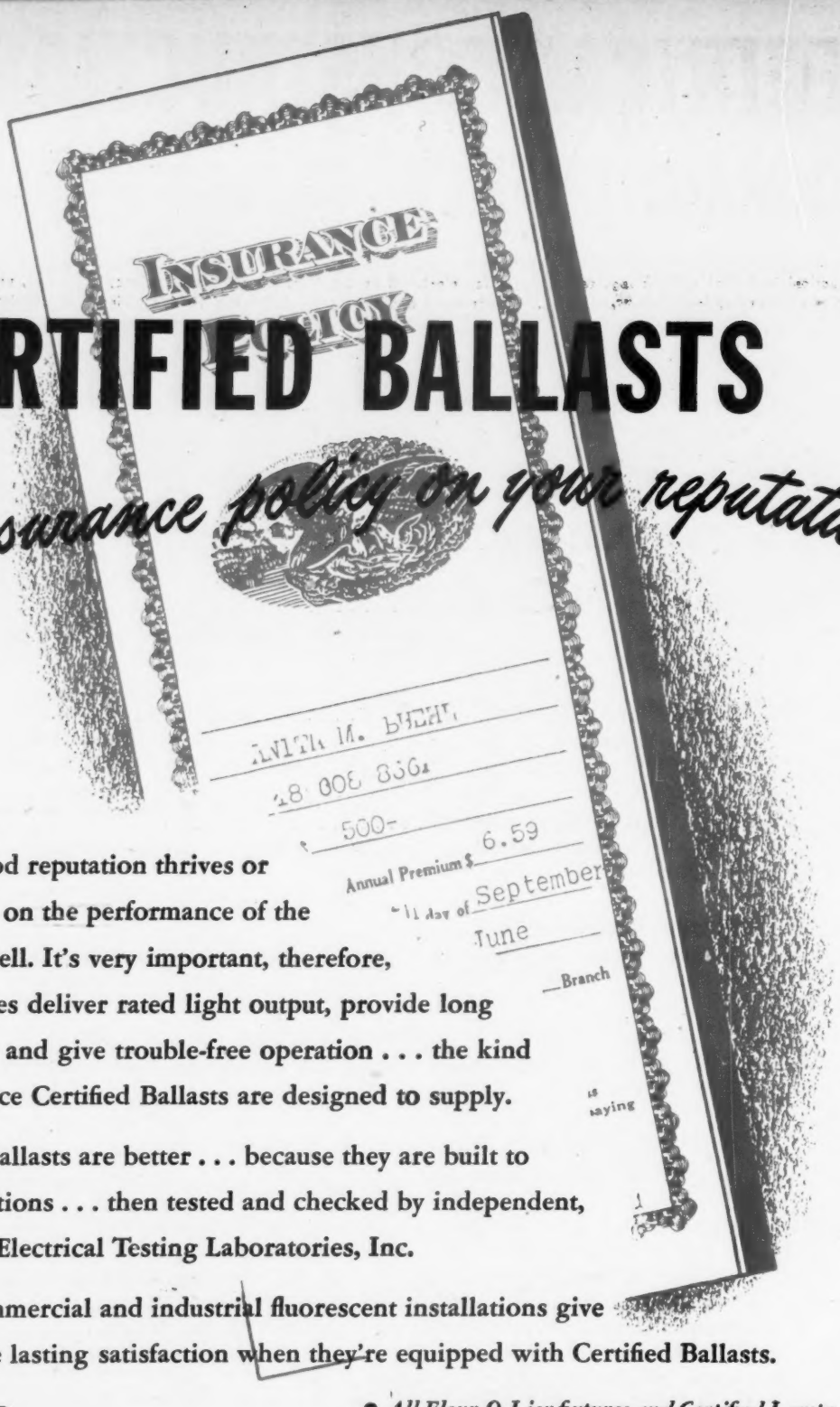
CERTIFIED BALLASTS

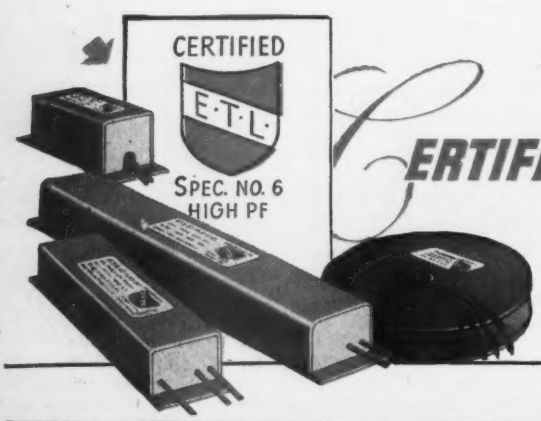
are an insurance policy on your reputation



Your good reputation thrives or falters largely on the performance of the fixtures you sell. It's very important, therefore, that your fixtures deliver rated light output, provide long lamp life and give trouble-free operation . . . the kind of performance Certified Ballasts are designed to supply.

Certified Ballasts are better . . . because they are built to rigid specifications . . . then tested and checked by independent, impartial Electrical Testing Laboratories, Inc.

That's why commercial and industrial fluorescent installations give more lasting satisfaction when they're equipped with Certified Ballasts.



● *All Fleur-O-Lier fixtures and Certified Lamps with circline tubes have Certified Ballasts.*

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Makers of Certified Ballasts for Fluorescent Lighting

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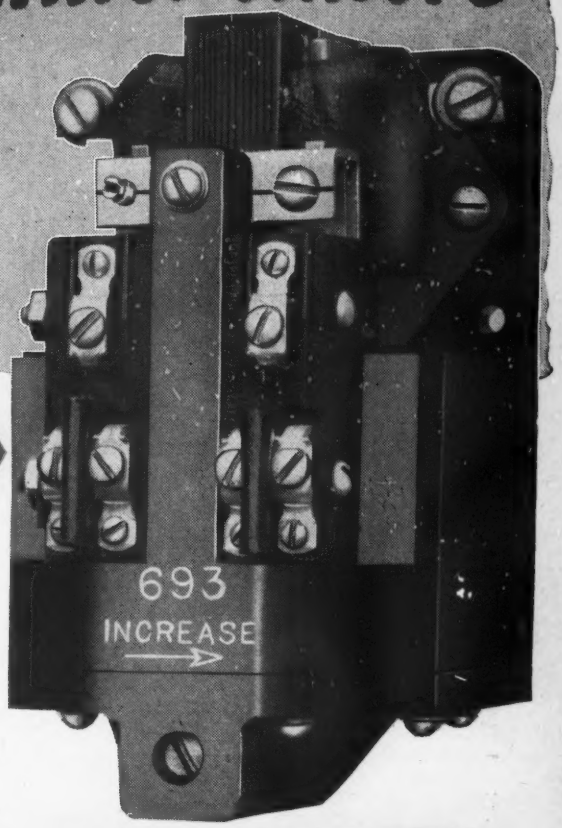
For machine designers . . .

2 New Cutler-Hammer Timers

- SMALL SIZE
- EASY TO ADJUST
- ACCURATE AND DEPENDABLE



BULLETIN 10337 A. C. PNEUMATIC TIMER

Designed for a broad variety of industrial control timing needs, such as machine tools, conveyors, automatic processing equipment, etc. Its extremely small size, 2¾ wide x 4⅞ high makes it desirable where space is at a premium. Its timing adjustment is especially simple, made with a screw driver from the front. 8 turns of the screw gives the entire timing range from 0.3 seconds to 3 minutes. Reset is practically instantaneous. Available either with one timing step or two timing steps, the two steps eliminate the need of one timing relay. The two steps of timing are independently adjustable over the entire range.

BULLETIN 13522 GENERAL PURPOSE ELECTRONIC TIMER

For use particularly where short or very accurate timing is required. The standard unit has a wide timing range, from 0.15 to 60 seconds. Shorter time settings or narrower ranges can readily be provided for special applications. Timing adjustment is easily made by turning knob of potentiometer rheostat which is equipped with a clearly graduated dial. The rheostat may be located inside the timer enclosure or at any convenient place on the machine remote from the timer. A heavy duty industrial type relay is used in the timing circuit. An outstanding feature is the extreme accuracy of the unit on repeat operations and under varying ambient temperature conditions.

For further information on Bulletin 10337 pneumatic timer, or Bulletin 13522 electronic timer, write CUTLER-HAMMER, Inc., 1306 St. Paul Ave., Milwaukee 1, Wisconsin. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto, Ont.

CUTLER-HAMMER
MOTOR CONTROL
C-H

WHAT EVERY SALESMAN SHOULD KNOW ABOUT FLUORESCENT LAMP BALLASTS

Fluorescent lamp ballasts are **NOT** all alike. Some makes are offered for sale on a low price basis as a substitute sales argument in lieu of performance matched to the requirements of the lamp. It's the design inside the metal box that determines the performance of a ballast. And, here's how electrical instruments registered the balance and resulting performance of a dual 40 watt Acme Electric and 9 other make ballasts on an unbiased test. These figures will help you sell more Acme Electric ballasts, at a fair profit against the low price, poor performance makes. Fixtures equipped with these "off standard" ballasts are not providing the full rated watts to the lamp, resulting in below rated lumen output, premature end blackening and shortened lamp life.

		ACME	MAKE B	MAKE C	MAKE D	MAKE E	MAKE F	MAKE G	MAKE H	MAKE I	MAKE J
LAMP WATTS OUTPUT	LEAD	40.6	31.1	32.6	32.0	34.2	33.7	31.1	30.8	36.4	32.2
	LAG	40.0	39.4	38.8	40.3	41.0	40.1	39.6	39.4	42.1	41.0
TOTAL		80.6	70.5	71.4	72.3	75.2	73.8	70.7	70.2	78.5	73.2
% LIGHT LOSS		NONE	11.9%	10.8%	9.6%	6.0%	7.7%	11.6%	12.3%	1.9%	8.5%

ACME ELECTRIC CORPORATION
361 Water Street — Cuba, N.Y.

Acme Electric TRANSFORMERS

Acme Electric manufactures Luminous Tube Transformers—Fluorescent Lamp Ballasts—Cold Cathode Lighting Transformers and Ballasts—Mercury Vapor Lighting Transformers—Radio and Television Transformers—Electronic Transformers—Door Bell, Chime and Signalling Transformers—Safety Transformers—Voltage Regulating Transformers—Step Down Transformers—Control Transformers—Warp-stop Transformers—Air Cooled Power Transformers—Rectifiers.

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★ **24 hours to make and install coils in 250 HP motor**

★ **Rebuilt 250 HP slip ring motor in 2½ days**

★ **3 days to rebuild 125 HP motor including 200 miles of truck shipment**

THESE ARE ACTUAL JOBS turned out by Giles Armature and Electric Works, Marion, Illinois . . . the kind A-C Certified Service Shops are doing every day!

When every hour costs money . . . when production is stopped . . . Allis-Chalmers Certified Service on motors, transformers, pumps, etc., can get you rolling again, *fast*. Dependable for prompt service on routine work, too.

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Check with us for *new* motors too. Stock or quick delivery on many sizes, types.

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks. A 2594

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Applied . . .
Serviced . . .

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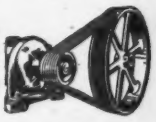
TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.



PUMPS — Integral motor and coupled types. Sizes and ratings to 2500 GPM.

ALLIS-CHALMERS, 930A SO. 70 ST.
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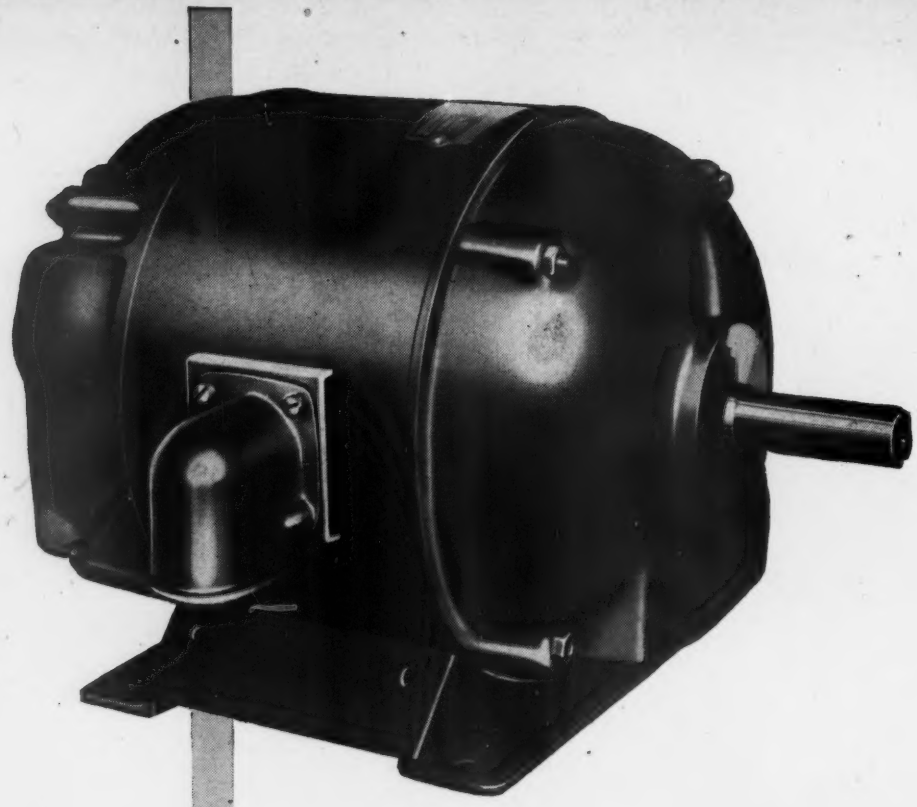

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(INSIDE AND OUT)

Robbins & Myers Uni-Shell Motors, made with protected end-heads, are protected *inside and out* —from wind and weather; from overheating; from need for frequent attention. Extra-wide, sealed ball bearings require lubricating only *every five years.* Cooling air circulates through the rotor as well as between windings and shell. Made drip-proof, splash-proof, or totally enclosed in all motor types with *identical* mounting dimensions. Sizes to 30 h.p. Here's protected, dependable motor performance. Be sure you get it! *Prompt shipments.* Write for literature.

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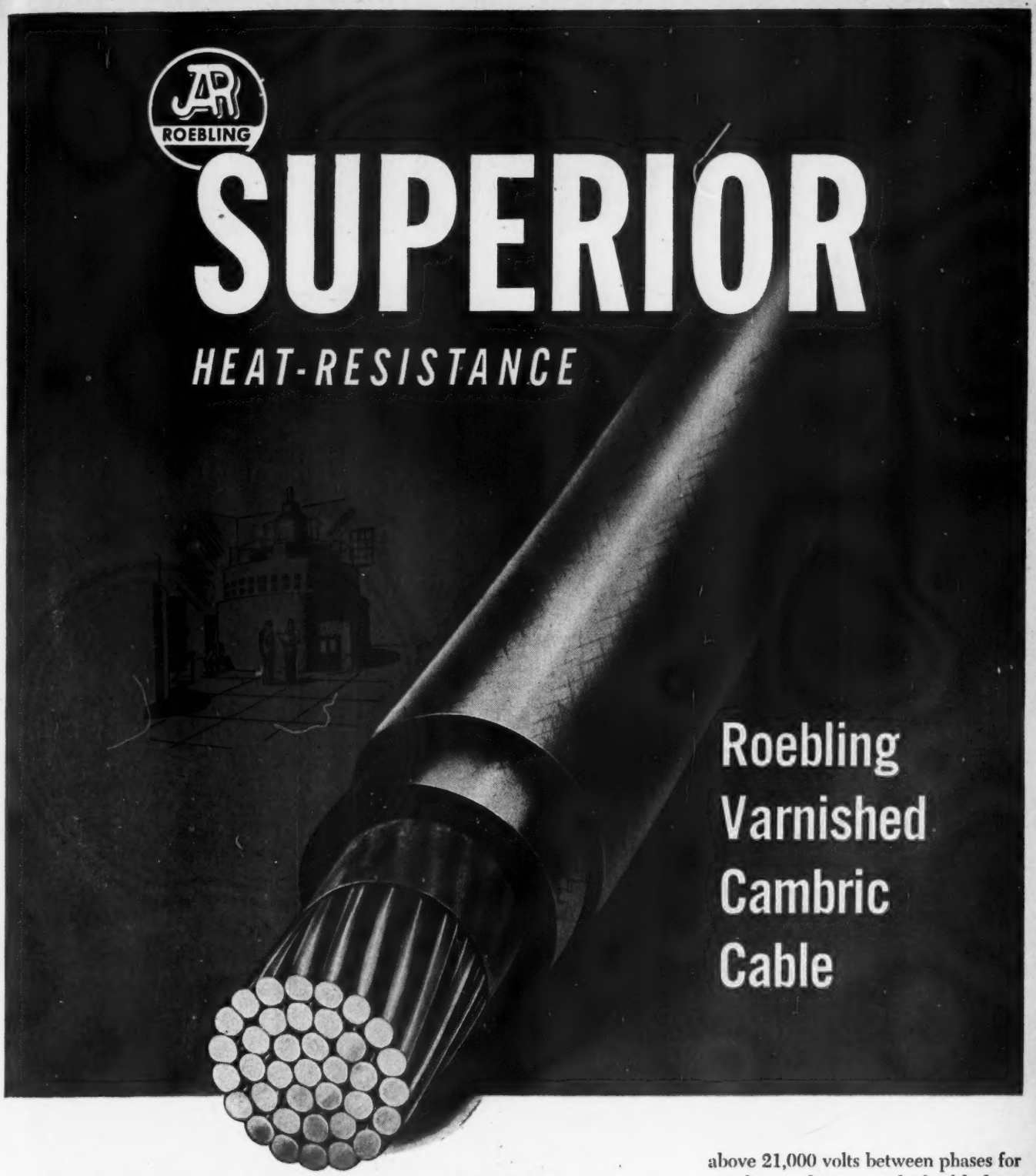

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FOR THE TORRID ZONES in power, heat and lighting circuits, Roebling Varnished Cambric Cable is your one best choice. The heat resistance of Varnished Cambric gives top efficiency on leads for generators, motors, transformers and oil switches.

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for a-c motors
up to 50 hp

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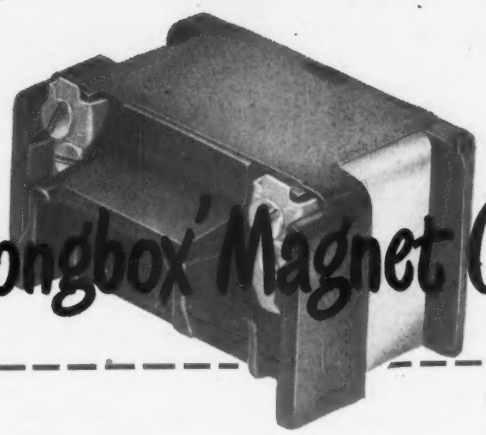
a complete NEW line

MOTOR STARTERS

with the

'Strongbox' Magnet Coil



all new all the way thru

Here it is—a completely new line of G-E motor starters—full-voltage starters made for extra-long life, faster installation. Designed for easy maintenance, but built so you can forget them.

NEMA Sizes 0, 1, 2, and 3—each size new all the way through. Everything's new—contacts, arc hood, magnet, armature, and the tough Strongbox magnet coil. Get your first G-E starter and compare!

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SO DIFFERENT
YOU CAN'T AFFORD TO WAIT
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Company_____

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Costs You LESS to Use the BEST Wire Connectors

IDEAL Wire-Nut®

Patented—No. 1,933,555

(THE SOLDERLESS, TAPELESS WIRE CONNECTORS)

Take a good look at this wire connector and the name it carries. The name "IDEAL" on a wire connector means these things—all of them important to you:

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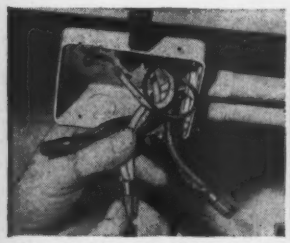
3. That from raw materials to finished product, it has been subject to the most rigid quality control . . . that it has been inspected and tested for material, components and uniformity no less than nine times. That's why the extra quality you get in "Wire-Nuts" never varies. In every 1,000 "Wire-Nuts" you can count on 1000 perfect wire connections.

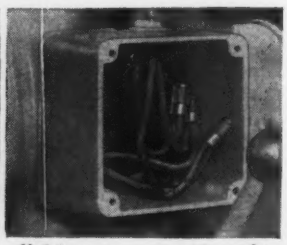
The pay-off comes, of course, in lower job costs for you—in better, safer wiring jobs.

See your IDEAL Distributor today or write for Wire-Nut Catalog WNC-947.



Circuit wiring with "Wire-Nuts" is simple because there are no tools to handle.

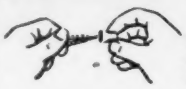
Industrial Wiring—Two "Wire-Nuts" support entire weight of fixture. Joint is strong, permanent.



Maintenance — easy to make changes. "Wire-Nuts" can be unscrewed and screwed on again.

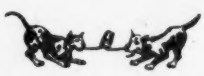
Electrical Contractors have used "Wire-Nuts" for over 20 years for circuit and fixture wiring. Millions in use.

Only "WIRE-NUTS" Give You All These Advantages . . .



EASIER TO USE. Just screw on — that's all! No solder, tape or tools.

RESISTS PULL-OUT. A "Wire-Nut" joint of two No. 14 wires will stand up to 176 pound pull.



DEPENDABLE. Not affected by vibration. Non-corrosive—resists abrasion.

SAFE. Wire ends fully insulated by strong moisture-resistant Bakelite shell that prevents "grounds" and "shorts".

TOP QUALITY. Built to precision standards. Inspected and tested with laboratory care.

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IDEAL

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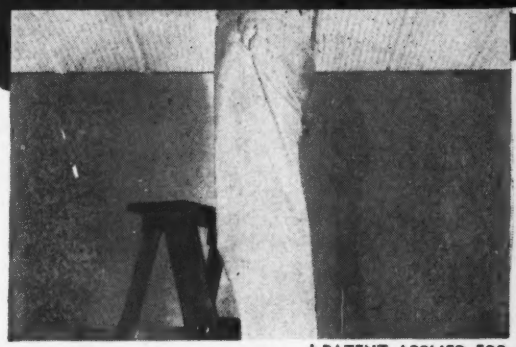
Completely LEVEL · Absolutely RIGID
NO OTHER OVERALL-TYPE FIXTURE CAN MAKE THIS CLAIM



† PATENT APPLIED FOR

Only †LEADERALL brings you all these valuable features:

Reduces the cost of finishing new ceilings . . . Featherweight unit-frames . . . Translucent moulded plastic (fire-resistant) louvers permit many more apertures per foot for maximum "sifting" of lamp rays and greatest shielding of lamps (45° visual cut-off) . . . Insures highest quality of light for greater beauty and greater durability . . . Lightweight construction eliminates structural strains . . . Destaticized plastic louvers—dust-resistant, stay-white* plastic . . . Adjustable tie-rods . . . Units instantly removable for cleaning or for quick re-lamping . . . Complete rigidity—moulded units withstand rough handling by maintenance men.

**Furnished, on special request, in colorfast hues for color schemes.*

Light LIGHT... all in *white!

The lightest weight over-all type fixture on the market, thanks to LEADER'S exclusive, one-piece *moulded translucent plastic louvers.* They are inflexible. Absolute uniformity, and more louvers per foot, achieving greater shielding of lamps, plus better diffusion of light, and no weight stress or strain on ceiling structure!

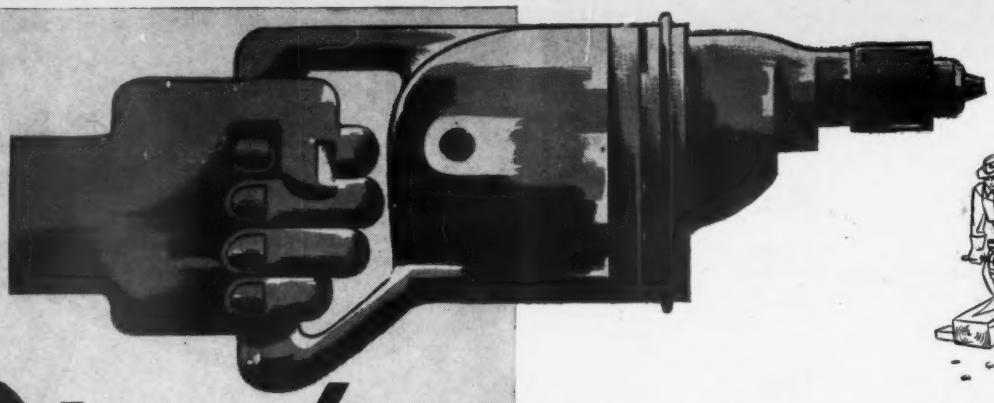
†Leaderall LOUVERED LIGHT CEILING

A revolutionary application of fluorescent lighting—light by the square yard. An overall speedway of man-made sunbeams that speeds up worker efficiency. Calm, cool brilliance uninterrupted . . . A cheerful, May-morning sky throughout the year. Super-rich beauty, plus a new high in abundant light that's kind to eyes.

Send for mechanical details—today!

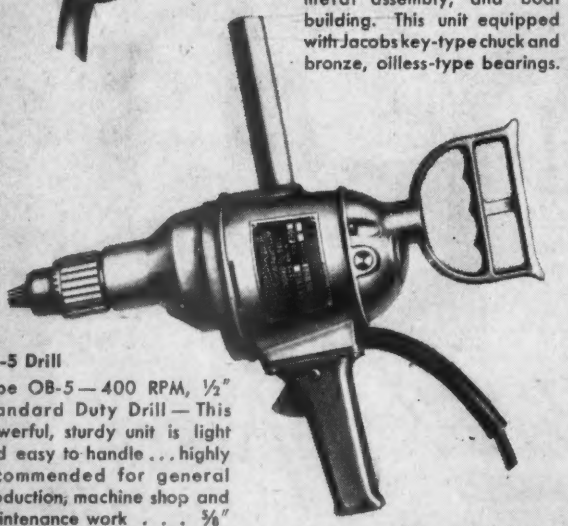
Leader Fluorescent Fixtures are sold and installed only by the better wholesalers and contractors.

LEADER ELECTRIC COMPANY
3500 N. KEDZIE AVENUE, CHICAGO 18, ILLINOIS
West Coast Factory: 2040 Livingston, Oakland 6, California



Signal Portable Electric Drills . . . Light — Powerful — Dependable

OB-8 Drill
Type OB-8 — 3000 RPM, ¼" Light Duty, High-Speed Drill — Designed for intermittent service, the OB-8 is ideal for radio repair work, wood and metal assembly, and boat building. This unit equipped with Jacobs key-type chuck and bronze, oilless-type bearings.



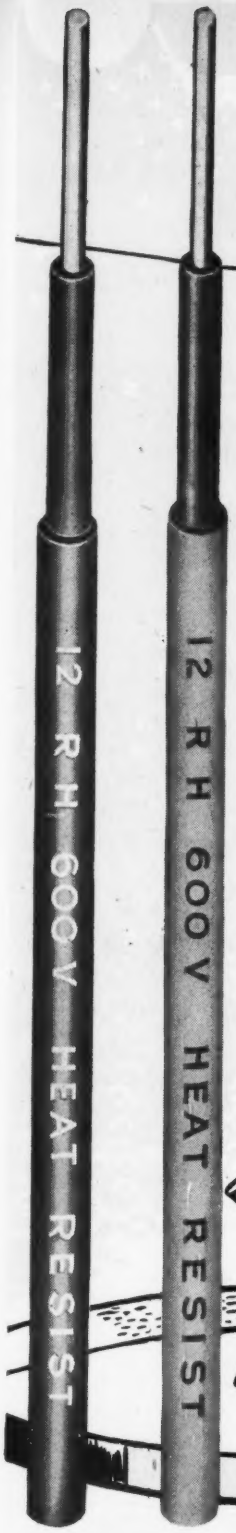
OB-5 Drill
Type OB-5 — 400 RPM, ½" Standard Duty Drill — This powerful, sturdy unit is light and easy to handle . . . highly recommended for general production, machine shop and maintenance work . . . ⅜" Jacobs key-type chuck also available.

OB-4 Drill
Type OB-4 — 1700 RPM, ¼" Standard Duty Drill — Built for long, tough service, the OB-4 is especially suited for general maintenance, construction and building work . . . can be supplied with the Jacobs key-type ⅜" chuck.

Job-tested Signal Portable Electric Drills are designed to do your job better . . . more efficiently . . . more economically. Yes, *Signal* gives you everything you want in a drill — air-cooled, grip-fitted handle . . . light weight . . . correct balance . . . dependable power . . . PLUS many years of trouble-free service. Ask your *Signal* Distributor for new descriptive literature on drills.

Signal

SIGNAL ELECTRIC MANUFACTURING CO.
Dept. C-1 Menominee, Michigan



CARRY A BIGGER LOAD WITH SMALLER WIRE

FOR LESS MONEY

Use Rome Type RH Building Wire

When you figure on wire or cable for industrial feeder circuits, *where voltage drop is not a problem,* be smart and figure on using Rome Type RH (Heat Resistant) Building Wire.

As compared to all other types of Building Wires, the National Electrical Code current carrying capacities and higher operating temperatures for Type RH, permit, for equal amperages, the use of smaller conductor sizes in nearly every instance. That's why, with Rome Type RH you can often use a smaller cable, at less cost, for the same current load.

Here a typical comparison* with circuit requirement of 285 amperes:

	Type RH	Type R
Required Conductor Size	300,000 CM	500,000 CM
Approximate Outside Diameter	.91"	1.10"
Weight per 1000 ft.	1139 Lbs.	1815 Lbs.
Required Conduit Size (3 conductor)	2½"	3"
Permissible Operating Temperature	75° C	60° C

In accordance with 1947 National Electrical Code

Underwriters' Approved

YOU CAN SAVE...

- On initial cost—in this case as much as 26 percent.
- By use of smaller conduit and fittings.
- In ease of handling lighter materials.

Further, there is longer life in this superior heat-resistant insulation.

FIGURE IT IN ROME TYPE RH AND SAVE

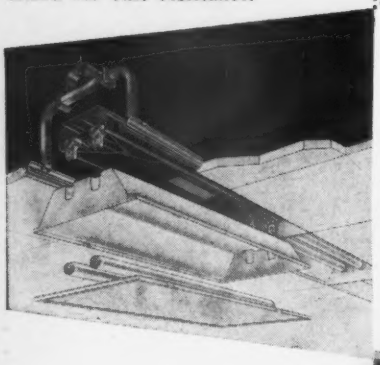
FROM BAR TO FINISHED WIRE

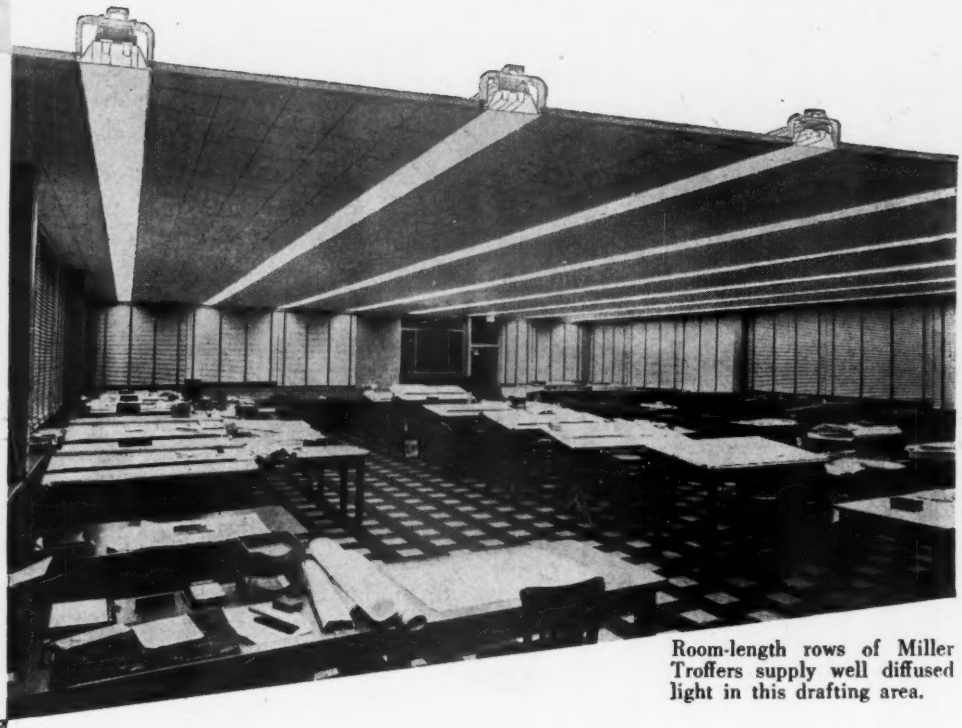
ROME CABLE CORPORATION

ROME • NEW YORK

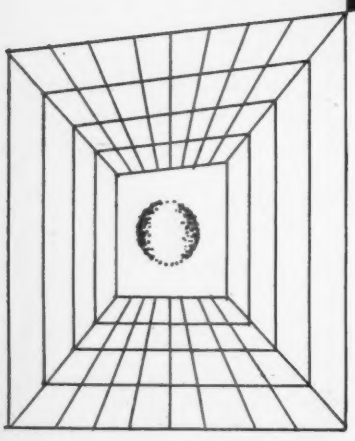
It Pays to Plan Lighting at the Drawing Board the MILLER Way

All parts are of quality construction. Channels are Bonderized for rust resistance.





Room-length rows of Miller Troffers supply well diffused light in this drafting area.



IT PAYS — because, besides providing the good lighting required. Miller Fluorescent Troffer Lighting Systems are a definite structural aid, most flexible for working out esthetic ceiling design and insuring architectural harmony . . . "CEILINGS UNLIMITED".* IT PAYS — because their wide range of reflector enclosures meet the lighting requirements of varied interiors. IT PAYS — because installation is simplified by Miller patented Ceiling Furring Hanger.

Miller lighting service is all-inclusive. It covers the needs of planned commercial and industrial lighting. Miller field engineers and distributors, conveniently located, are at your call.

THE miller COMPANY
SINCE 1844
ILLUMINATING DIVISION, MERIDEN, CONNECTICUT
ILLUMINATING DIVISION: Fluorescent, Incandescent, Mercury Lighting Equipment. HEATING PRODUCTS DIVISION: Domestic Oil Burners and Liquid Fuel Devices. ROLLING MILL DIVISION: Phosphor Bronze and Brass in Sheets, Strips and Rolls

*Reg. Trademark U. S. Pat. Off.

You know you're right with "G-E White"

Each step in the manufacture of General Electric White rigid conduit, from raw material to final inspection, is carefully controlled to bring you a uniform, high-quality product. Interior and exterior surfaces are smooth . . . threads are sharp and clean-cut. Finish is hot-dipped zinc, with an additional coating of baked-on Glyptal lacquer.

Always, when you think of conduit for protection from atmospheric corrosion, think of "G-E White." For further information, see your nearest General Electric Construction Materials distributor, or write to Section C14-118, Construction Materials Department, General Electric Company, Bridgeport 2, Connecticut.

*Trade-mark Reg. U. S. Pat. Off.

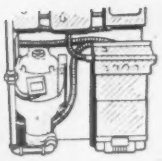
GENERAL ELECTRIC

RACEWAYS ROUNDUP

with your

GENERAL ELECTRIC

Construction Materials Distributor



If you're wondering how to get raceway protection for wiring in cramped quarters, for machine tool or temporary wiring, General Electric flexible steel conduit is the answer. This conduit is strong, yet very flexible. It's quickly installed, and the zinc-coated strip steel is wound in a way that makes wire pulling easy.

Don't forget General Electric EMT for those light jobs that don't require the heavy-duty protection of rigid conduit. You'll like the way lightweight EMT can be easily handled . . . easily bent . . . quickly installed with threadless fittings. This thin-wall, welded steel tubing has an exterior surface of electrogalvanized zinc and an interior of corrosion-resisting enamel.

General Electric switch and outlet boxes are made in a variety of sizes, shapes, and depths for every purpose. Most are available either galvanized or with black-enamel finish. All cable and conduit boxes have improved knockouts, are easy to install, and have the approval of Underwriters' Laboratories, Inc.

On your next order, why not try the time-saving, "one-stop, one-package" service that your General Electric distributor can supply? Because he carries the complete General Electric line, you can order every item you need from him. No need to run around getting part of your requirements in one place and part in another. It's the kind of service busy contractors need to help stretch scarce working hours.

Conduit Products

Another Achievement
By **TRIANGLE...**

GLAZON

TRADE MARK

PROTECTIVE COVERING

Gives You the Longest Lasting, Easiest to Handle, BUILDING WIRE You've Ever Used!

Available in sizes from No. 14 through No. 6 AWG with either solid or stranded conductor.

Only TRIANGLE'S New "GLAZON" TRADE MARK Gives You:

LONGER LIFE — Because it utilizes a recently perfected material that can't rot, can't burn, can't absorb moisture..."Glazon" protective covering establishes new standards of permanence!

BETTER FISHABILITY — Because it's smaller, because it's smoother, because it's more flexible, "Glazon" building wire can be pulled through conduits easier than any other wire you've ever used!

GREATER VALUE — Because it's easier to handle, easier to pull, easier to strip...because it's tougher, stronger, longer lasting...because it *costs no more* than ordinary wire—"Glazon" building wire is by far your biggest value!

What GLAZON TRADE MARK is:

"Glazon" is the trade name registered by Triangle Conduit & Cable Company to identify its recently perfected type of protective outer covering. The exceptional degrees of flexibility, smoothness and durability shown by "Glazon" covering stem from many factors, including:

Braid based on an inorganic substance derived from glass which cannot rot, burn, absorb moisture, or deteriorate with age.

Saturant developed specifically for the braid. Bonds permanently to the individual fibers and sets new standards for resistance to heat, moisture, fire and rot.

Technique of application locks the saturant in the braid. It will not chip, flake or peel off. This unique combination of saturant and braid makes full use of the extremely high tensile strength of the braid material and produces a smaller, smoother, tougher and more flexible outer covering—which is "Glazon."

For further information on "Glazon" building wire and other Triangle products, contact your jobber or your nearest Triangle District Office:

Albany, N. Y., 11 N. Pearl St.
Atlanta, Ga., Bona Allen Bldg.
Baltimore, Md., 802 Hearst Tower Bldg.
Boston, Mass., 470 Atlantic Ave.
Charlotte, N. C., 210 Builders' Bldg.
Chicago 6, Ill., 20 N. Wacker Dr.
Columbus 8, Ohio, 1356 W. Seventh Ave.
Detroit 2, Mich., 914 Stephenson Bldg.
Houston, Texas, 4101 San Jacinto St.
Indianapolis, Ind., R. R. #5—Box 555
Kansas City 8, Mo., 1827 Grand Ave.
Los Angeles 13, Calif., 923 E. Third St.
Minneapolis 4, Minn., 1419 Second Ave., S.
New Orleans, La., 348 Baronne St.
New York 7, N. Y., 50 Church St.
Newark 2, N. J., 189 Market St.
Palm Beach, Fla., 244 S. County Rd.
Philadelphia 7, Pa., Real Estate Trust Bldg.
Pittsburgh, Pa., Wm. Penn Hotel Bldg.
San Francisco 5, Calif., 383 Brannan St.
Seattle 33, Wash., 12221 Greenwood Ave.

If It's "GLAZON" It's Made by TRIANGLE . . .
If It's Made by TRIANGLE It MUST Be Right!

ARTERIES FOR ELECTRICAL SYSTEMS — INCORPORATED

IT MUST BE RIGHT !

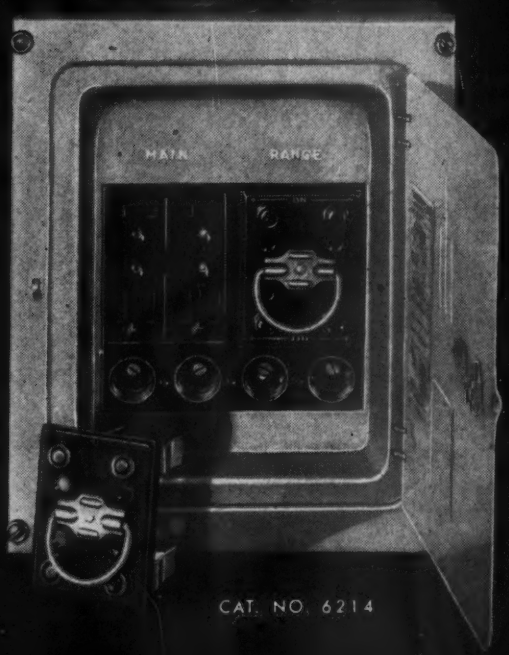
TRIANGLE CONDUIT & CABLE CO., INC.

1908 Jersey Avenue • New Brunswick, N. J.
Plants at New Brunswick, N. J. and Moundsville, W. Va.

Building Wire • Bare Wire • Armored Cable • "Glazon" Triex Non-Metallic Sheathed Cable • Service Entrance, Service Drop, Varnished Cambric Braided or Leaded, Trioprene Trench, Power and Parkway Cables • Rigid Conduit • Electric Metallic Thin Wall Conduit • Flexible Steel Conduit

The switch is to

GENERAL



CAT. NO. 6214

ENCLOSED SAFETY SWITCHES • SERVICE ENTRANCE EQUIPMENT
BRANCH-CIRCUIT OR RESIDENCE PANELS • PANELBOARDS FOR
LIGHT AND POWER DISTRIBUTION

MORE AND MORE Electrical Contractors Specify "GENERAL"

GENERAL
SWITCH CORP.

45 ROEBLING STREET, BROOKLYN 11, N. Y., U. S. A.

SALES OFFICES

Amarillo, Texas	*Chicago 14, Ill.	Glassport, Pa.	New Orleans 12, La.	San Antonio 2, Tex.
*Atlanta 3, Ga.	Cincinnati 20, Ohio	Houston 3, Texas	*Philadelphia 47, Pa.	*San Francisco 3, Cal.
*Baltimore, Md.	Cleveland 16, Ohio	Indianapolis 4, Ind.	Phoenix, Arizona	*Seattle 4, Wash.
Birmingham, Ala.	Dallas 5, Texas	*Los Angeles 13, Cal.	*Portland 9, Oregon	Spokane 8, Wash.
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*WAREHOUSE STOCK MAINTAINED

EXPORT OFFICE: NEW YORK 11, N. Y.

ACCURATE TAPES

WORK BETTER
—because they're made better!

TAKE A GOOD LOOK AT THE TAPE YOU USE—

Every package of ACCURATE tape helps you produce better taped joints in less time. You know this as soon as you've stripped the first length off a new roll. The tape peels off straight and neat without ravelling —tapes up tight and even on the joint —and breaks clean right where you tear it. ACCURATE tapes work better because they're made by men who specialize in tape making.

PROTECTIVE PACKAGING

DIELECTRIC STRENGTH

HIGH TENSILE

EASY TEAR-OFF

NON-DETERIORATING

EASE OF APPLICATION

—if it's
ACCURATE TAPE
here's what you'll find!

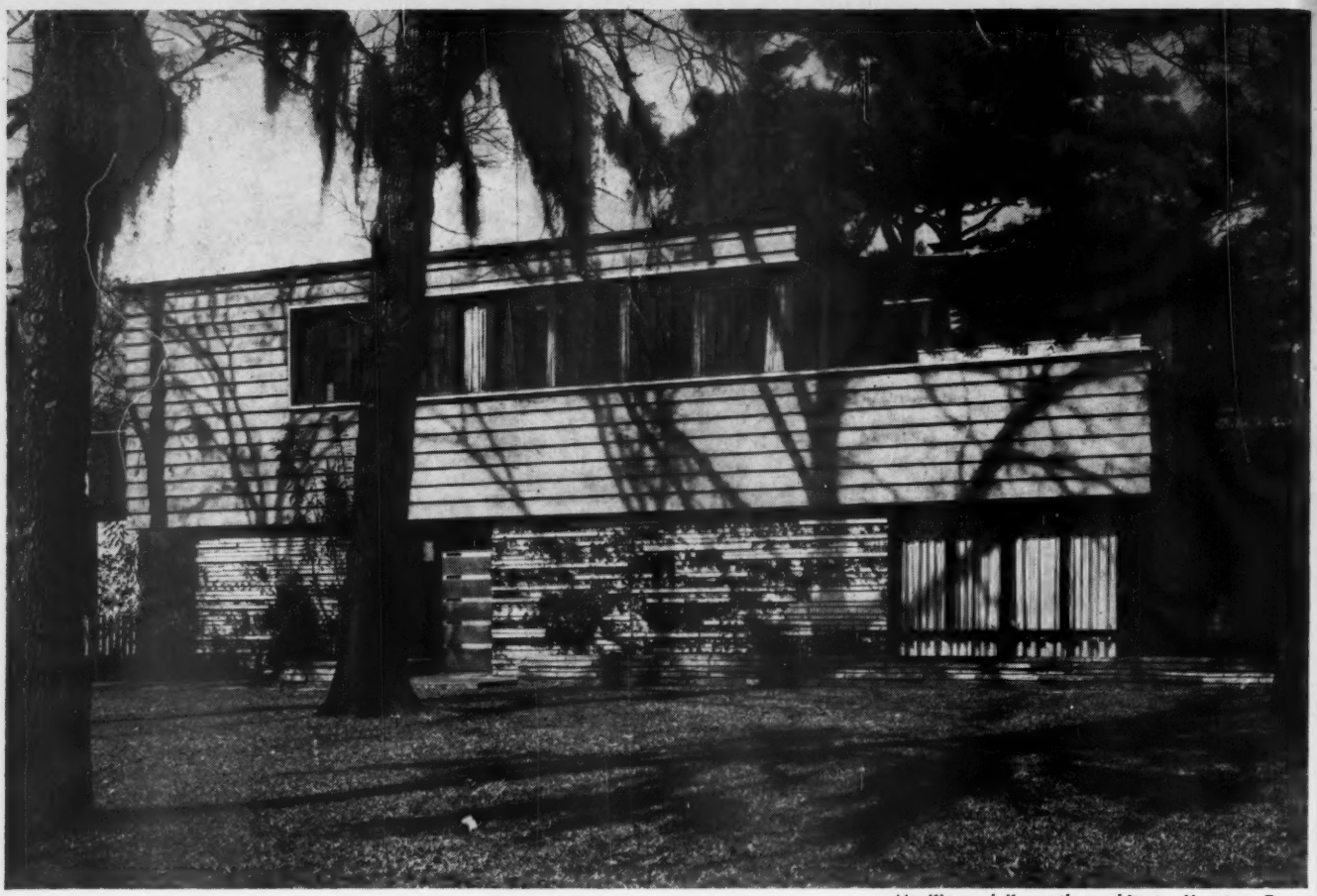
First you'll see proper protective packaging. Substantial protective carton; heavy cellophane wrapper inside. Hold a length to a bright light—no pinholes anywhere. Then, when you use it, you'll notice ACCURATE tape never creeps or ravels and breaks off straight and neat. There's more than meets the eye, too. Every foot of ACCURATE tape is made to ASTM Standards and every roll contains guaranteed footage. That's why—when you buy ACCURATE tapes—you get real tape value. Next time you need tape—order ACCURATE. Write for catalog and name of distributor nearest you.

amc

ACCURATE MFG. COMPANY

GARFIELD, NEW JERSEY

35 YEARS MAKING TAPES EXCLUSIVELY



MacKie and Kamrath, architects, Houston, Texas

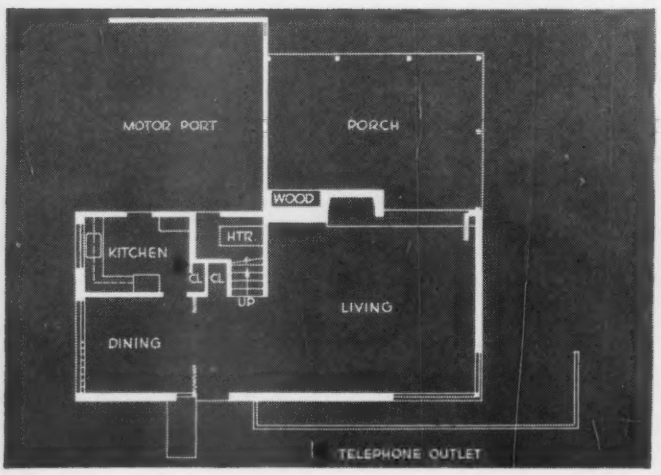
TELEPHONE RACEWAYS IN THE MODERN MANOR

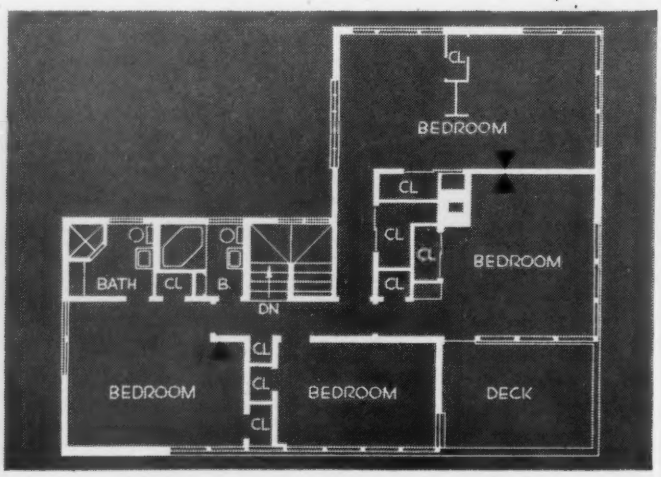
Today good building practice calls for built-in telephone raceways. They assure the owner against exposed telephone wires on walls and woodwork. They provide him with *planned* telephone facilities. And they mean extra profits for you.

In two-story homes, telephone raceways should be provided for future telephones upstairs as well as down.

Remember—NO TELEPHONE CONTRACT IS REALLY COMPLETE UNLESS IT INCLUDES RACEWAYS FOR TELEPHONE WIRING FACILITIES.

BELL TELEPHONE SYSTEM





What Does RACO Mean?

RACO (rā'co) 1. The top line of steel switch and outlet boxes. 2. Quick, easy installation for contractors. 3. Dependability for architects. 4. Customer preference and steady demand for jobbers.

You don't need a dictionary to find out what RACO means to the electrical trade. The RACO Line is approved by the Underwriters' Laboratories, Inc. Contractors prefer the well known RACO quality. Architects specify the reliable RACO Line. Wholesalers enjoy the profitable repetitive volume.

You can always rely on RACO

RACO

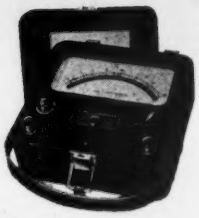
ALL-STEEL PRODUCTS

ALL-STEEL EQUIPMENT Inc.—800 Kensington Ave., Aurora, Illinois

"A BOX FOR EVERY NEED"

(Model 430) PORTABLE TEST INSTRUMENTS combining dependability, ruggedness, compactness and scale readability. Equipped with hand calibrated, mirror scales. Available for AC and DC requirements, and as DC and single-phase AC Wattmeters.

SENSITIVE RELAYS a line of sensitive relays including the Model 705 which provides positive control at levels as low as ½ microampere. Non-chattering magnetic contacts handle up to 10 watts at 120 volts.



(Model 622) ULTRA-SENSITIVE INSTRUMENTS portable DC and AC Thermo instruments for precision measurement of potentials and minute currents involving electronics, thermo-couples or laboratory research.

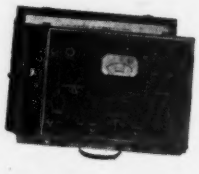
INSTRUMENTS

TO SPEED AND SIMPLIFY ELECTRICAL CONSTRUCTION AND MAINTENANCE

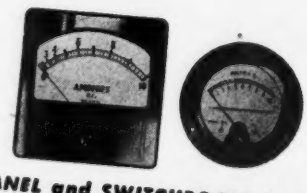
Illustrated are but a few of the many specialized instruments available from WESTON . . . all designed to simplify and speed-up electrical and electronic installations, production testing, and maintenance. For details, see your local representative, or write Weston Electrical Instrument Corporation, 578 Frelinghuysen Avenue, Newark 5, New Jersey.

WESTON *Instruments*

ALBANY • ATLANTA • BOSTON • BUFFALO • CHARLOTTE • CHICAGO
CINCINNATI • CLEVELAND • DALLAS • DENVER • DETROIT
HOUSTON • JACKSONVILLE • KNOXVILLE • LITTLE ROCK • LOS
ANGELES • MERIDEN • MINNEAPOLIS • NEWARK • NEW ORLEANS
NEW YORK • ORLANDO • PHILADELPHIA • PHOENIX • PITTSBURGH
ROCHESTER • SAN FRANCISCO • SEATTLE • ST. LOUIS • SYRACUSE • TULSA
IN CANADA, NORTHERN ELECTRIC CO., LTD., POWERLITE DEVICES, LTD.

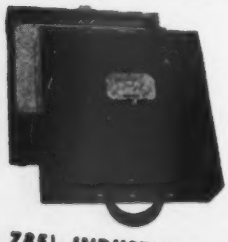


(Model 798) MULTI-PURPOSE TUBE-CHECKER offering provision for testing Receiving Tubes — Voltage Regulator Tubes—Light Duty Thyratron Tubes such as 2A4—6D4—884—885—2051. Scale is calibrated "Good-Bad" as well as in mutual conductance range.



PANEL and SWITCHBOARD INSTRUMENTS a complete line of instruments in all types, sizes and ranges required for switchboard and panel needs . . . including DC, AC power frequencies and radio frequency, rectifier types and D.B. meters.

(Model 697) VOLT-OHM MILLIAMMETER one of a line of pocket-size meters, Model 697 combines a selection of AC and DC voltage, DC current, and resistance ranges. Ideal for maintenance testing and many inspection requirements.



(Model 785) INDUSTRIAL CIRCUIT TESTER a versatile, portable tester for laboratory or maintenance needs, where an ultra-sensitive instrument is required. Provides 27 AC and DC voltage, AC and DC current, and resistance ranges. (DC sensitivity 20,000 ohms per volt.)

(Model 799) DIRECT READING INSULATION TESTER a compact, one-hand-operated insulation tester with .1 to 10,000 megohm range, using a test potential less than 50 volts d-c. Indicates: Insulation properties—Leakage resistance—Conductivity of insulating materials—Leakage due to moisture absorption.

(Model 769) ELECTRONIC ANALYZER incorporating a conventional Volt-Ohm-Milliammeter with self-contained power source—a high-impedance electronic Volt-Ohmmeter using 115 volt, 60 cycle power—a stable, probe-type, Vacuum Tube Voltmeter, for use to 300 megacycles.

CENTRAL ~~SPANS~~ CONDUIT

Your Central Rigid Steel Conduit Distributor is proud of his record of prompt delivery. And he fights to maintain that record, even if it means extra hours or personal inconvenience.

BUT

At times he can't make fast delivery of Conduit. One reason for this, is today's critical shortage of steel which prevents us from producing enough Central Conduit to provide your distributor with all he needs to meet the greatest demand in history.

You can depend on this, though—when your Central Rigid Steel Conduit Distributor gets conduit, you will quickly receive a fair share of his stock.

CENLACO a hot dipped galvanized and lacquered finish, inside and out.

CENTRAL WHITE electro-galvanized outside and black enameled inside.

CENTRAL BLACK permanent, baked-on black enamel finish, inside and out.

SPANG-CHALFANT

Division of The National Supply Company
General Sales Office: Grant Bldg., Pittsburgh, Pa.
District Offices and Sales Representatives in Principal Cities

BEAT HIGH COSTS WITH HIGH PRODUCTION

Tool up with "TOLEDO"

Good tools make a tremendous difference in productivity . . . sending your production UP . . . and costs down. Give your mechanics the tools preferred by thousands of experienced hands . . . specify TOLEDO Pipe Tools and Power Pipe Machines! You will like their simple, sturdy construction . . . compactness and light weight for ease of handling . . . and the smooth, clean-cut, leak-proof threads produced by Toledos. You will like Toledo performance—in hand tools or power equipment—to do the work easier . . . faster . . . and reduce costs! The Toledo Pipe Threading Machine Co., Toledo, Ohio. New York Office, No. 2 Rector Street Building.

POWER DRIVES

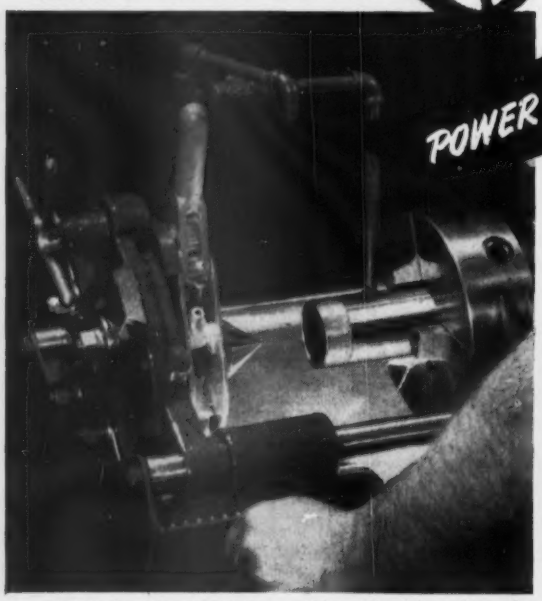
One man using a Toledo Portable Power Drive with Toledo hand threading Tools can cut a 2" thread in 18 seconds, 4" threads in less than 2 minutes.

RELY ON THE LEADER

TOLEDO

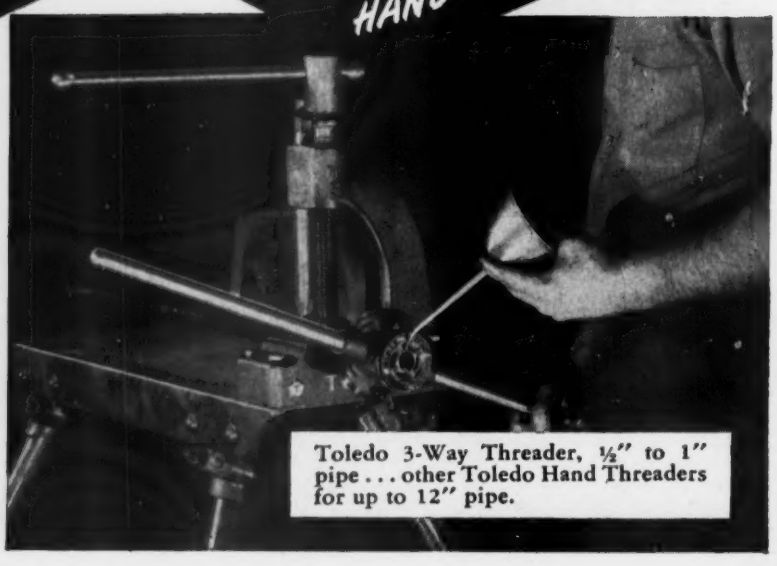
FOR PRECISION PIPE TOOLS

POWER THREADERS



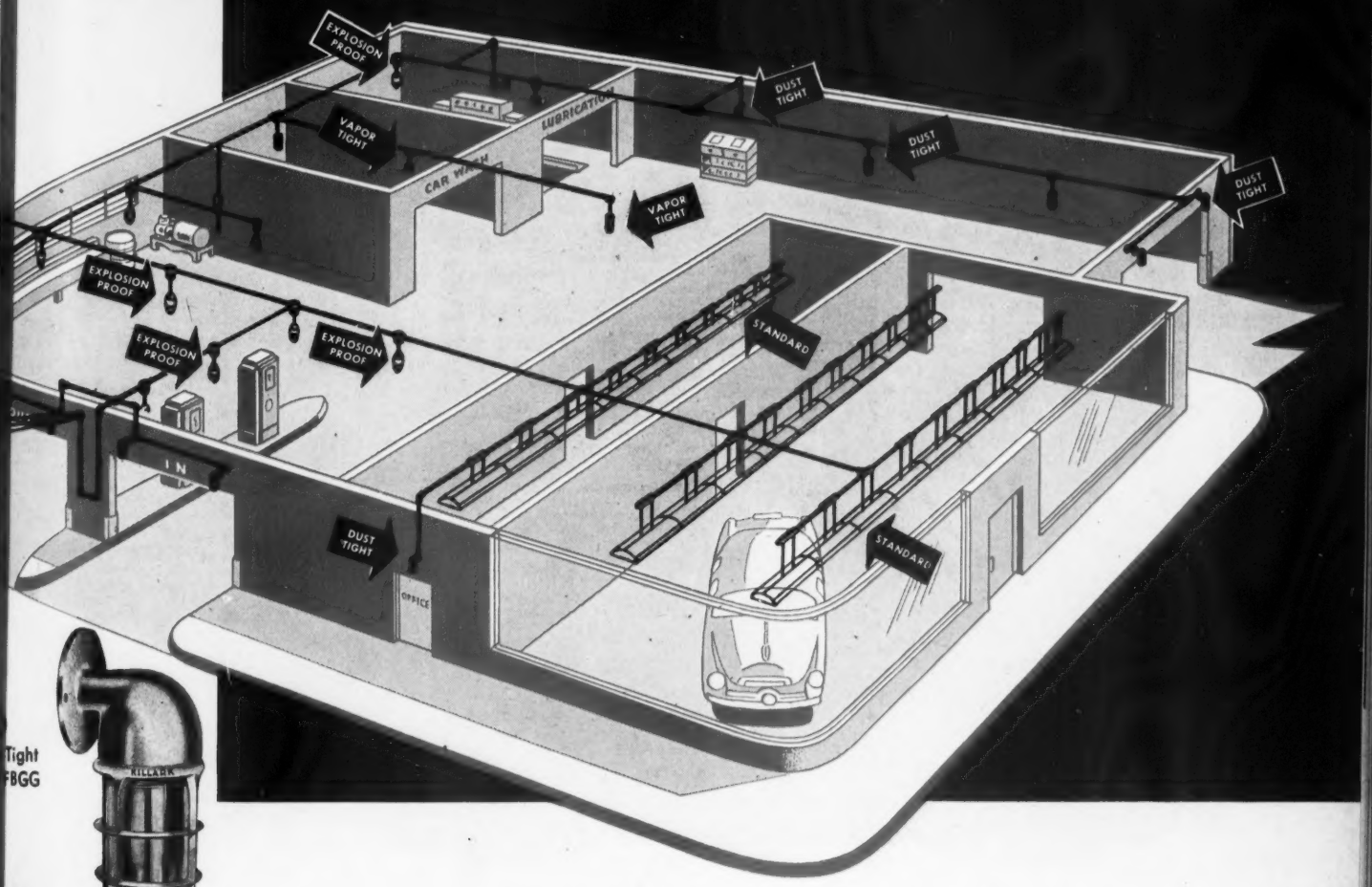
Toledo No. 999 Power Pipe Machine threads 2" pipe in 22 seconds, cuts off 2" pipe in 10 seconds. Portable . . . ½" to 2" pipe incl.

HAND THREADERS



Toledo 3-Way Threader, ½" to 1" pipe . . . other Toledo Hand Threaders for up to 12" pipe.

FOLLOW THROUGH COMPLETE INSTALLATIONS ...with the KILLARK COMPLETE LINE



Tight
FBGG

B
Explosion-Proof
Type ELG

C
rd Type
L-RR

Modern requirements and codes demand a wide variety of special and standard fittings to cover complete installations. You can simplify complete job follow-through — increase installation efficiency — by concentrating on the Killark *complete* line for all fitting needs. From standard to special vapor-tight and explosion-proof fittings, Killark offers a complete line of highest quality fittings — listed as Standard by Underwriters' Laboratories, Inc.

A. Killark Vapor-Tight Lighting Fixtures and Fittings — combine dust-tight and vapor-tight construction for outstanding performance in locations where moisture constitutes a hazardous condition . . . and for exterior installations.

B. Killark Explosion-Proof Fixtures and Fittings — meet rigid specifications for hazardous locations — wherever inflammables or explosives are handled.

C. Killark Standard Electrolets — round, rectangular and oval, for threaded, unthreaded, Thinwall and Heavy-Wall conduit.

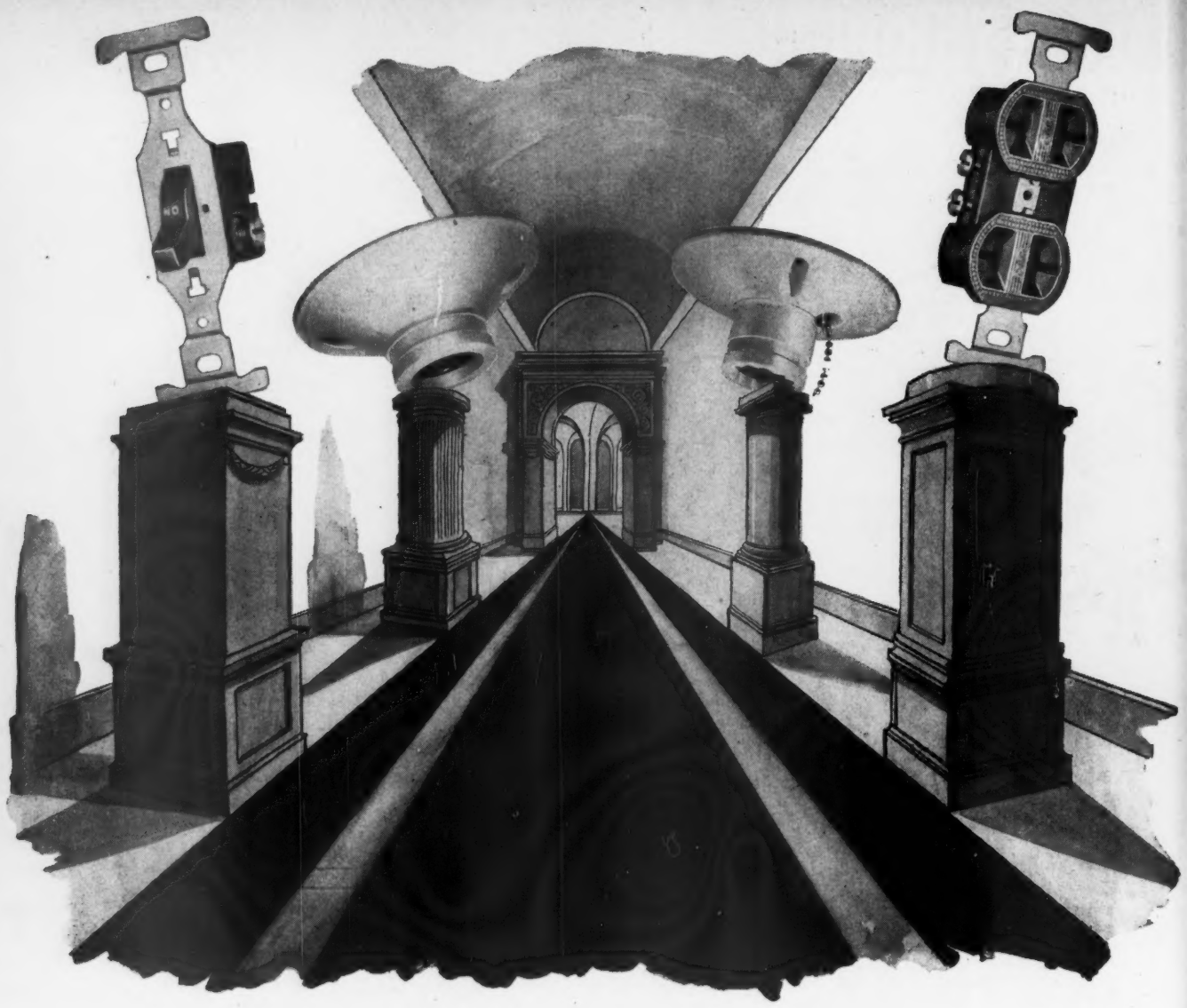
Send for the Killark Catalog showing all of the Killark fittings and fixtures.

KILLARK
ST. LOUIS

Killark
ELECTRIC MANUFACTURING COMPANY

Offices and Warehouses: Atlanta, Baltimore, Boston, Chicago, Denver, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Seattle, Syracuse.
Offices: Cincinnati, Cleveland, Dallas, Detroit, Kansas City, Minneapolis.

Vandeventer & Easton Aves.
SAINT LOUIS 13. MO.



...AND NOBODY CAN KNOCK THEM OFF...

firmly fixed on their pedestals of top quality, perfect performance, exceptional durability in service, Slater Lifetime Wiring Devices need yield the place of honor to no other products in this field. From a complete family of items to fill a contractors every requirement, those exhibited here are outstanding examples:

The #400 toggle, left front, incorporates major improvements in the strength and weight of its bakelite body, its switch action and strength, and in its extremely heavy preloaded contacts. It is the best buy in its field. . . . The #300 T slot receptacle, right front, is one of the sturdiest, most eye appealing on the market. It will never lose its clean and firm action even in constant hard usage. The #280, right rear, has extraordinarily strong, one piece bakelite construction, a great advantage over porcelain, ample extra size for ease and surety of installation, and absolutely no breakage. The #275, for 3" and 4" boxes, is the keyless version of #280, and has all the same virtues of indestructibility and extra size for installation.

Contractors...

Say Slater

Write for free catalogue.

Slater
ELECTRIC & MFG. CO.
WOODSIDE, NEW YORK
Lifetime wiring devices

EASY WAY TO GET *Quick* DELIVERY

OF YOUR ELECTRICAL WIRE AND CABLE NEEDS

Paranite wire or cable is made under the watchful eye of SQC—Statistical Quality Control! Nothing is left to chance. Scores of graphs, tests, measurements—figures and figures—by columns and rows of columns—are drilled and marshalled, compiled and analyzed with individual operations still in progress. With SQC on guard you can confidently recommend and use Paranite for lasting satisfaction.

Is prompt delivery of electrical wire and cable on your worry list? You can get fast service by calling on your Paranite wholesaler.

The Paranite Supply Line enables him to fill your order *when you want it.* What your wholesaler needs to supplement his own stock he can get with speed and dispatch from a completely stocked factory warehouse that's literally right in his own backyard. You get delivery of your electrical wire and cable without delay.

Call on Paranite's fast delivery service to keep things moving.

IF IT'S **PARANITE** IT'S RIGHT!

DISTRIBUTED THROUGH WHOLESALERS

PARANITE WIRE AND CABLE

Division of ESSEX WIRE CORPORATION

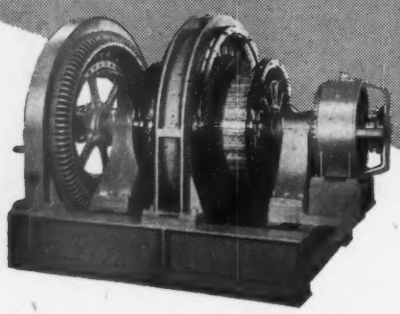
FORT WAYNE 6, INDIANA

WAREHOUSES* AND SALES OFFICES: *Atlanta, Ga.; *Chicago, Ill.; Cleveland, Ohio; Dallas, Texas; *Detroit, Mich.; *Kansas City, Mo.; *Los Angeles, Calif.; *Newark, N. J.; Philadelphia, Pa.; *Portland, Oreg.; *St. Louis, Mo.; *San Diego, Calif.; *San Francisco, Calif.

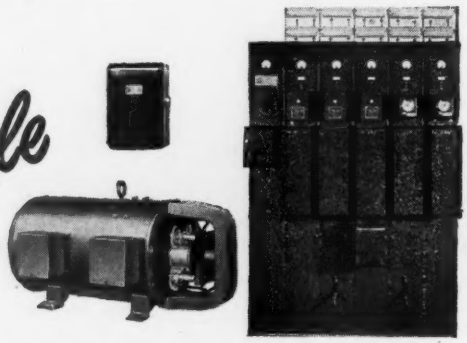
ELECTRICAL WIRES AND CABLES *"BETTER THAN CODE REQUIRES"*

EP SPECIALIZATION *Means* PROVED PERFORMANCE

• For 35 years, The Electric Products Company has specialized in the manufacture of High-Current, Low-Voltage Motor-Generators and other special electrical equipment. The result is Proved Performance . . . an assurance of lower-cost operation, higher operating efficiency and more dependable life-time service. For every application, E. P. designs and builds equipment that fits exactly the requirements of the particular operation.



for example



FOR ELECTROLYTIC PROCESSES

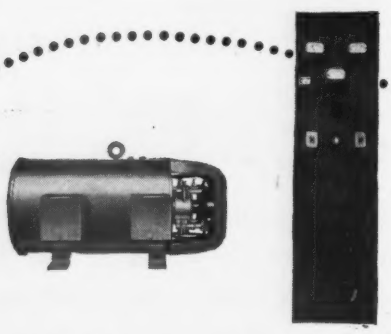
E. P. Electrolytic Motor-Generators employ Undercut Commutator Mica to prolong commutator and brush life; Pole Spacers to help assure sparkless commutation; Micrometer Adjustment of Interpoles, an exclusive feature, to guarantee outstanding performance; Correct Mechanical Design that means every part of the motor-generator is swept by a cooling stream of air; and Fully Accessible Construction for easy inspection.

ASK FOR BULLETIN 202

FOR INDUSTRIAL-TRUCK BATTERY-CHARGING

In 1910, The Electric Products Company introduced the first Automatic Battery Charger. Today they most efficiently and advantageously combine completely automatic operation . . . the modified constant-voltage method of charging . . . individual application design . . . elimination of complicated control or ventilating systems . . . and specialized low-voltage designing.

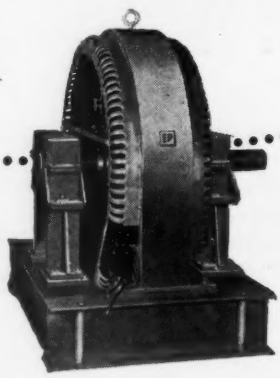
ASK FOR BULLETIN 203



FOR STANDBY BATTERY-CHARGING

Since 1923, Diverter-Pole Motor-Generators have proved to be the most reliable, maintenance-free and efficient source of direct current for Control Bus Battery Charging. They assure maximum battery life, give full-automatic operation and protect themselves against harmful overloads. Requiring only infrequent inspection, they are extensively used in isolated automatic and supervisory-controlled substations.

ASK FOR BULLETIN 207



SYNCHRONOUS MOTORS

Since 1923, The Electric Products Company has been building Synchronous Motors for applications that demand a quality far superior to that of ordinary commercial machines. Proof of this accumulated design and manufacturing experience is evident in every unit. From stator frame to rotor windings, E. P. specialization is your guarantee of long life and trouble-free operation.

ASK FOR BULLETIN 211

also

INDUSTRIAL DYNAMOMETERS
SPECIAL MOTORS AND GENERATORS
FREQUENCY CHANGERS
SYNCHRONOUS GENERATORS

EP X-36

THE ELECTRIC PRODUCTS COMPANY

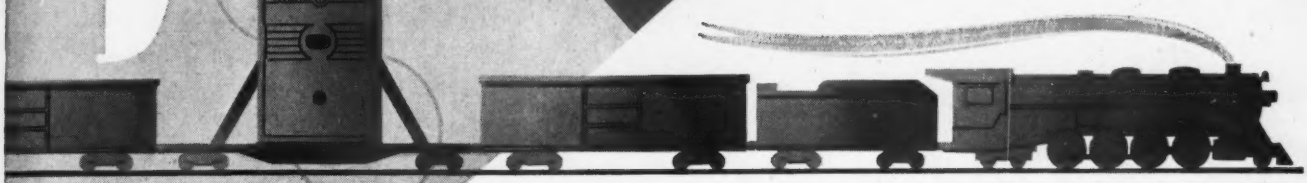
1720 CLARKSTONE ROAD CLEVELAND 12, OHIO

HERE COMES THE

Trumbull Train

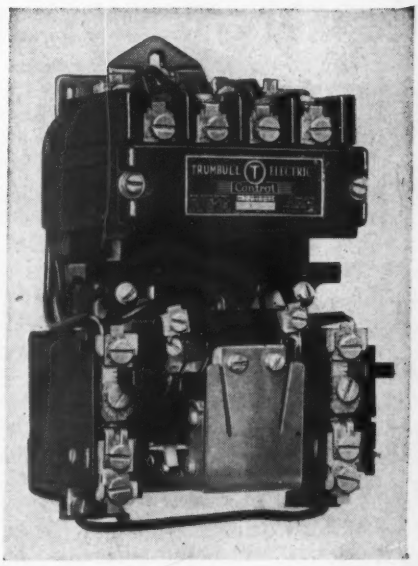
OF ELECTRICAL PROGRESS

A whole parade of new Trumbull products is headed your way! A new advancement in the entire line of Trumbull products — Flex-A-Power systems, Panel Boards, Control Centers, Switches and Motor Starters — all radically different. So watch for Trumbull's new product announcements during 1949. Here's the first —



A NEW

Magnetic Motor Starter and Magnetic Contactor



New, from top to bottom, Trumbull Starters and Contactors in sizes 0, 1, 2, 3 give maximum protection to motors up to 50 hp, 440 v. Look at all their important new advantages:

LONGER CONTACT LIFE —
Actual factory tests show the silver contacts on the Trumbull starter "make and break" for millions of operations — many times more than any starter on the market.

EASY TO MAINTAIN —
Silver contacts have permanently attached springs that are easy to remove. Terminals are located on the front and are easy to wire — a screw driver is all you need to disassemble starter — can be accomplished in less than a minute.

EASY TO INSTALL AND SERVICE —
Note convenient knockouts, large terminals, front connections, and ample wiring space.

GREATER PROTECTION —
Bi-metallic relay heaters follow motor's heating curve. Easily adjusted for automatic or manual reset.

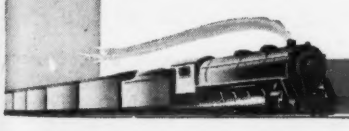
BUILT TO LAST —
All parts resist corrosion and moisture. Examine plastic coil enclosure to see how the tough varnish impregnation protects windings. Contact points and cold-molded asbestos arc hood eliminate arcing . . . give clean "make and break" contact.

QUIET OPERATION —
Permanent lubricant impregnated in the plastic coil enclosure keeps magnet guides sliding smoothly . . . eliminates low voltage "chatter."

FOR MORE INFORMATION about this latest Trumbull development, write for Circular TEC 11. THE TRUMBULL ELECTRIC MANUFACTURING CO., Plainville, Conn. Other factories and offices throughout the United States. Foreign representation.

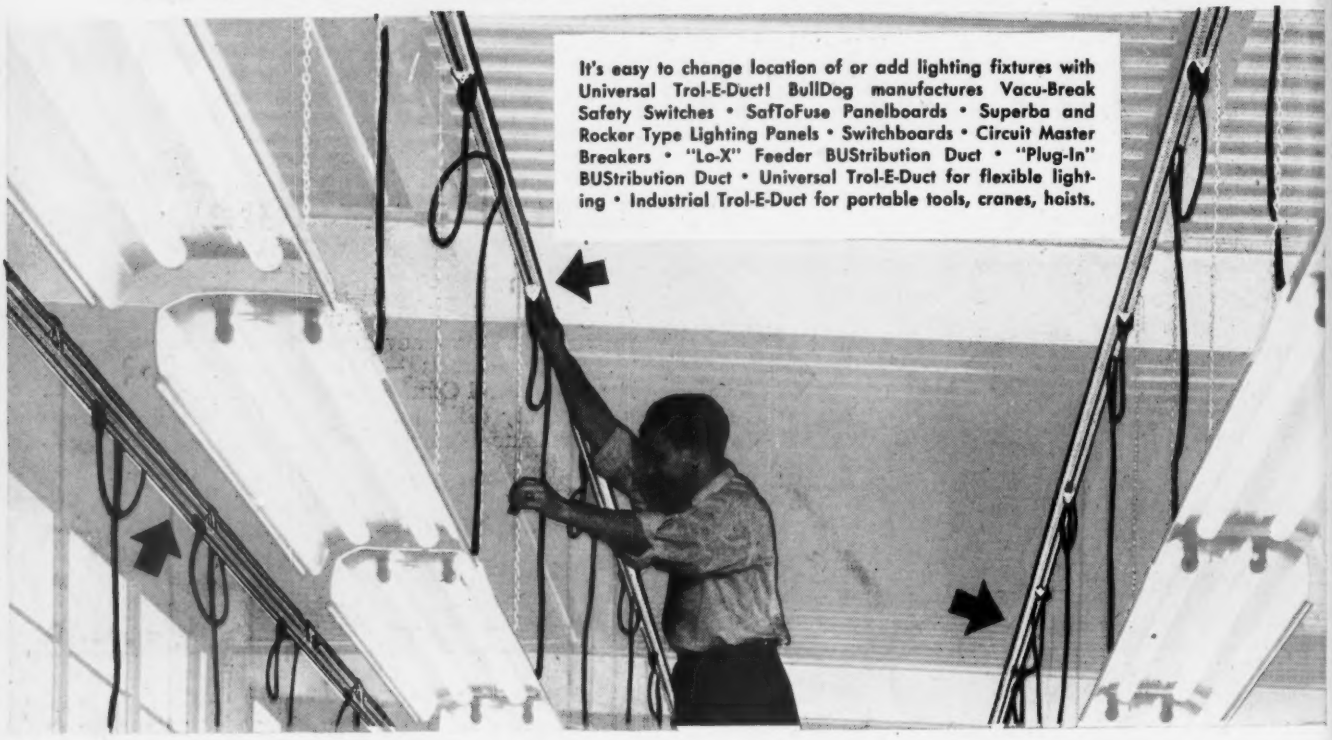
Men Who Observe the Best Electrical Practice Make It a Practice to Use

TRUMBULL (T) ELECTRIC



TRUMBULL'S TRAINLOAD OF NEW PRODUCTS

This message will also appear in a broad list of publications that are read by the men you seek to influence . . . your prospective customers



It's easy to change location of or add lighting fixtures with Universal Trol-E-Duct! BullDog manufactures Vacu-Break Safety Switches • SafToFuse Panelboards • Superba and Rocker Type Lighting Panels • Switchboards • Circuit Master Breakers • "Lo-X" Feeder BUStribution Duct • "Plug-In" BUStribution Duct • Universal Trol-E-Duct for flexible lighting • Industrial Trol-E-Duct for portable tools, cranes, hoists.

Highlights on low lighting costs

HAVE you ever looked into the cost of a simple job like moving or adding a fixture in an ordinary lighting system?

First, there are new materials — wire, conduit, junction box, outlet box, hangers, etc.; then, labor expense for splicing, threading, bending, taping, etc.; finally, loss of production while power is shut off for connections.

There is no need to see profits drain away like this. Plug the leak with BullDog Universal Trol-E-Duct.

BullDog Universal Trol-E-Duct is a flexible electrical system providing current *where* you want it, *when* you want it. Every inch of the enclosed copper bus bars in Universal Trol-E-Duct can be utilized as an outlet for lighting fixtures. You can plug in for current at any point along its slotted duct. Bus bar capacity: 50 Amps., 250 Volts.

BullDog Universal Trol-E-Duct is 100% salvable, thus lends itself to major or minor plant changes. Simply dismantle prefabricated parts and reinstall to meet your new requirements. *Not a single piece need be scrapped.*

Ask your local BullDog Field Engineer to show you a Universal Trol-E-Duct installation in your own neighborhood.

BullDog's Field Engineers welcome the opportunity to sit in with you during the early planning stages of a building project. Their knowledge of electrical distribution layout can mean savings in installation costs, as well as efficiency and reliability in actual operation. Why not take advantage of this service?

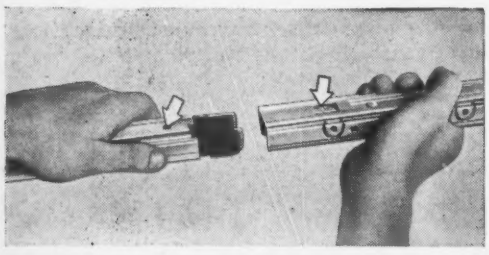
BULLDOG ELECTRIC PRODUCTS COMPANY

DETROIT 32, MICHIGAN • FIELD OFFICES IN ALL PRINCIPAL CITIES

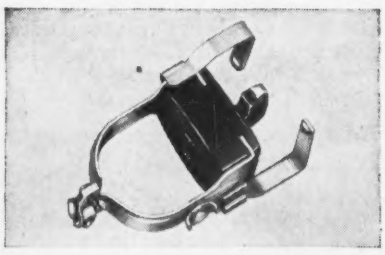
IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO

BULLDOG

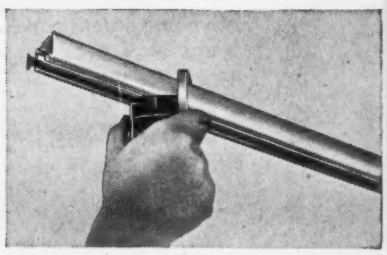
HEADQUARTERS FOR ELECTRICAL DISTRIBUTION



BullDog Universal Trol-E-Duct is prefabricated in one to ten foot lengths for easy installation. A variety of couplings with specialized purposes join sections. Connections slip together; no nuts or bolts.



Terminal Twistout Plug, one of several types used to tap current from Universal Trol-E-Duct. Duct also accommodates movable trolley-type outlets.



Inserting a twistout plug is easy. Contact end is inserted in slot and twisted. "L"-shaped supporting fingers slide easily over top of duct.

MODEL NOS. 3021 & 3021-B

MITCHELL "SLIMLINE" LUMINAIRE

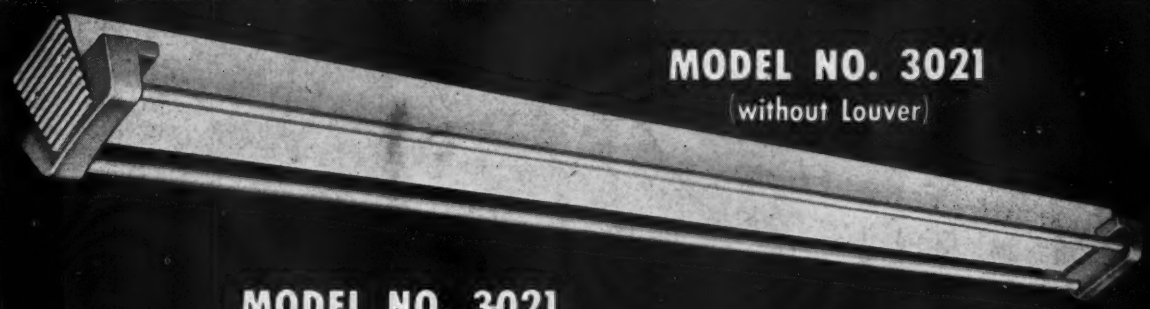
FOR TWO 8-FOOT FLUORESCENT SLIMLINE LAMPS

INSTANT-START NO FLICKER

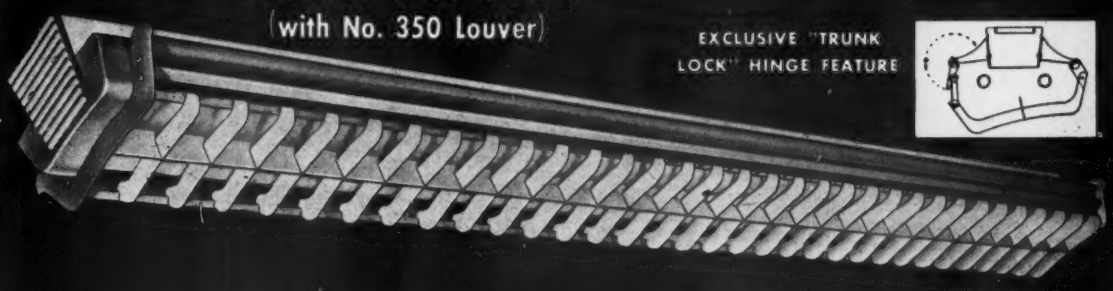
NO STARTERS REQUIRED

REDUCED MAINTENANCE

L-O-N-G-E-R LAMP LIFE



MODEL NO. 3021
(without Louver)



MODEL NO. 3021
(with No. 350 Louver)

EXCLUSIVE "TRUNK LOCK" HINGE FEATURE

An 8-Foot Fixture Packed in a 4-Foot Carton!

Featuring Exclusive Sectional Construction

Sectional Construction assures safer shipment and easier installation—not possible with fragile, hard-to-ship unwieldy 8-foot units of the ordinary type.

Amazingly Flexible Installation
CONTINUOUS ROWS
Decorative end plate is removed to expose knock-out. Power wires can be fed from fixture to fixture
PENDANT HANGING
Only two stems required to support the entire 8-foot unit. Can be hung individually or in continuous rows

The Utmost in Beauty—Plus Simple Installation and Economical Maintenance

Another tremendous advance in fluorescent lighting by MITCHELL. This outstanding 2 lamp "Slimline" Luminaire combines luxurious new beauty with the maximum in superb illumination. Model Nos. 3021 and 3021-B provide instant-starting—no undesirable flickering and no starters required. Maintenance costs are greatly reduced with this revolutionary new type of lighting.

Designed for easy installation in any commercial interior—either flush or pendant mounted, individually or in continuous rows. New sectional construction enables MITCHELL Slimline units to be hung by one man. Model No. 350 Hinged Louver can be hung on the basic open type fixture in just seconds. Swings down on patented "trunk-lock" mechanism for easy relamping and cleaning.

SPECIFICATIONS: This MITCHELL Slimline fixture uses two 8-foot Slimline lamps. Available in two types: No. 3021 for 200 milliamp operation and No. 3021-B for 300 milliamp operation. Sockets are completely concealed in die cast housing. Heavy-gauge steel channel finished in durable Baked White Enamel. Die cast end housing, fluted end cover, and metal sides of louver are finished in Satin Aluminum. Overall dimensions (without louver): 96¼" long; 7⅞" wide; 5¼" high. Basic unit and accessory louver are individually packed. Sectional construction permits packing in *one* compact, easy-to-stock, 4-foot carton. No hazards, no struggling with unwieldy ordinary 8-foot units. Fixture operates on 110-125 volts 60 cycles A.C. Underwriters approved.

4-LAMP "SLIMLINE": MITCHELL "Slimline" Fluorescent Luminaires are available also in 4-Lamp Models (Nos. 3020 and 3020-B), incorporating the exclusive MITCHELL "Slimline" advantages. Write for complete descriptive literature.

MITCHELL MANUFACTURING COMPANY
2525 CLYBOURN AVENUE, CHICAGO 14, ILLINOIS
In Canada: Mitchell Manufacturing Company, Ltd., Toronto, Canada

MITCHELL
First Choice in Lighting

Yes, Mamie, fifteen bucks ... if you had to wait for a call from the maker's salesman each time you bought your wad! Only the broadest possible distribution through thousands of dealers makes it economically feasible to sell a pack for a nickel. And the same thing goes in the distribution of electrical products, too. If at T&B we had to replace our distributors' thousands of salesmen, their hundreds of strategically located warehouses with on-the-shelf stocks of standard brand products, their speedy on-the-spot deliveries, their quotation services and pricing departments — well, Mamie, our customers would pay and pay, and we mean pay! Selling exclusively through wholesalers is the only way that T&B can offer its superlatively engineered, ultra-complete line of fittings at the soundest price schedule in the industry.

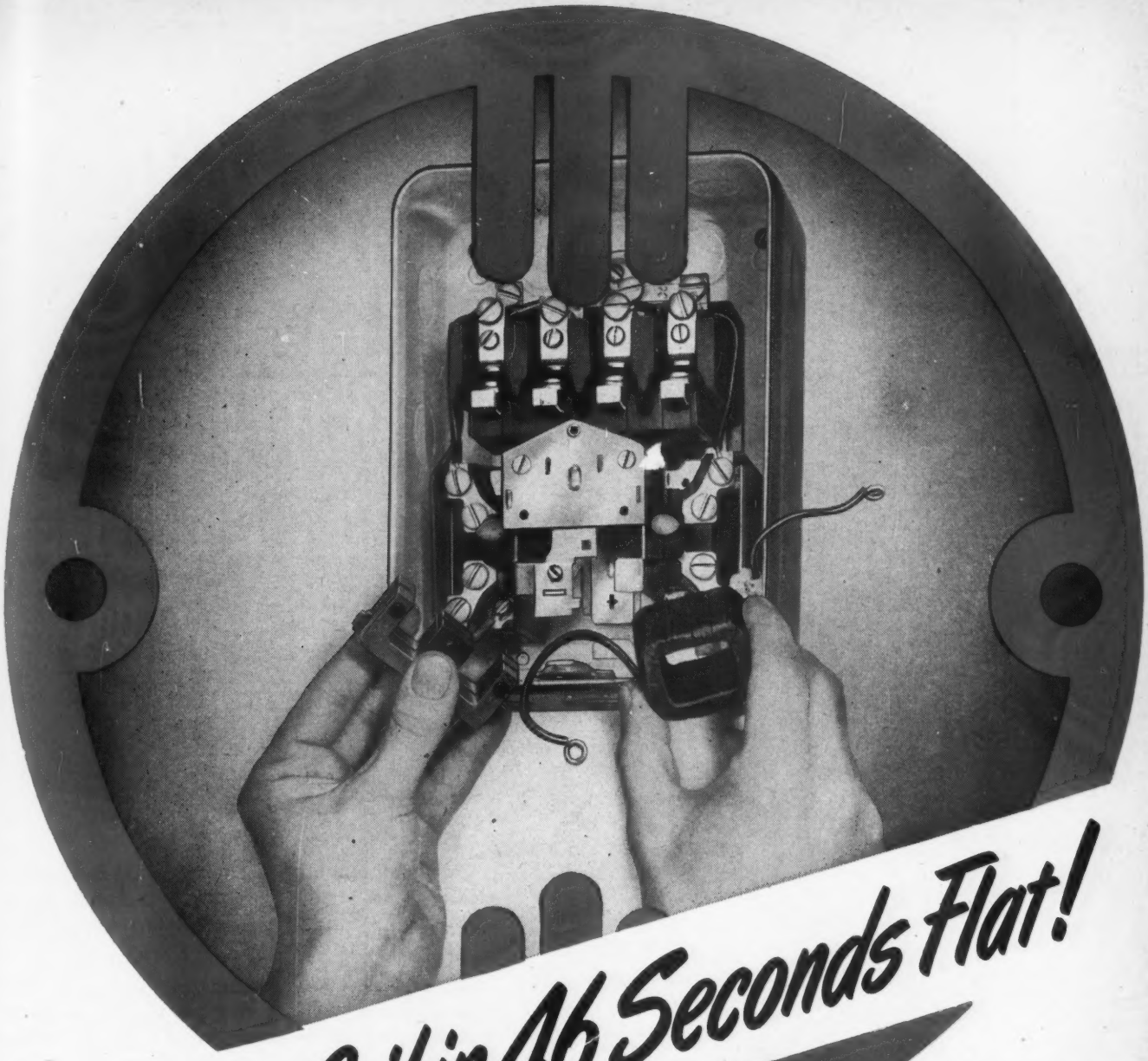
THE THOMAS & BETTS CO.
INCORPORATED
ELIZABETH 1, NEW JERSEY

T&B ENGINEERED

CONNECTORS
LOCKNUTS . BUSHINGS
CLAMPS . COUPLINGS
EXTENSIONS
HANGERS . NIPPLES
REDUCERS
STRAPS . SUPPORTS
GROUNDING DEVICES
FLOOR BOXES
SERVICE ENTRANCE FITTINGS
CAST JUNCTION AND PULL BOXES
FIXTURE SUPPORTS
TUBELETS
SOLDERLESS LUGS, CONNECTORS, ETC.
COMPRESSION SPLICES, DEAD-ENDS, ETC.

BETTER PRODUCTS
BETTER SERVICE
LOWER COSTS

THROUGH AND BECAUSE OF YOUR ELECTRICAL WHOLESALER



Change Coil in 46 Seconds Flat!

Change is FASTEST, EASIEST with Federal Noark Motor Starter

IT'S ALMOST "PRESTO, CHANGE!" replacing a coil in Federal Noark Motor Starters. Only three quick operations to get the old coil—three more, in reverse, to insert the new one. Federal design is the simplest, fastest on the market today. All parts readily accessible from the front. Saves time, effort and money.

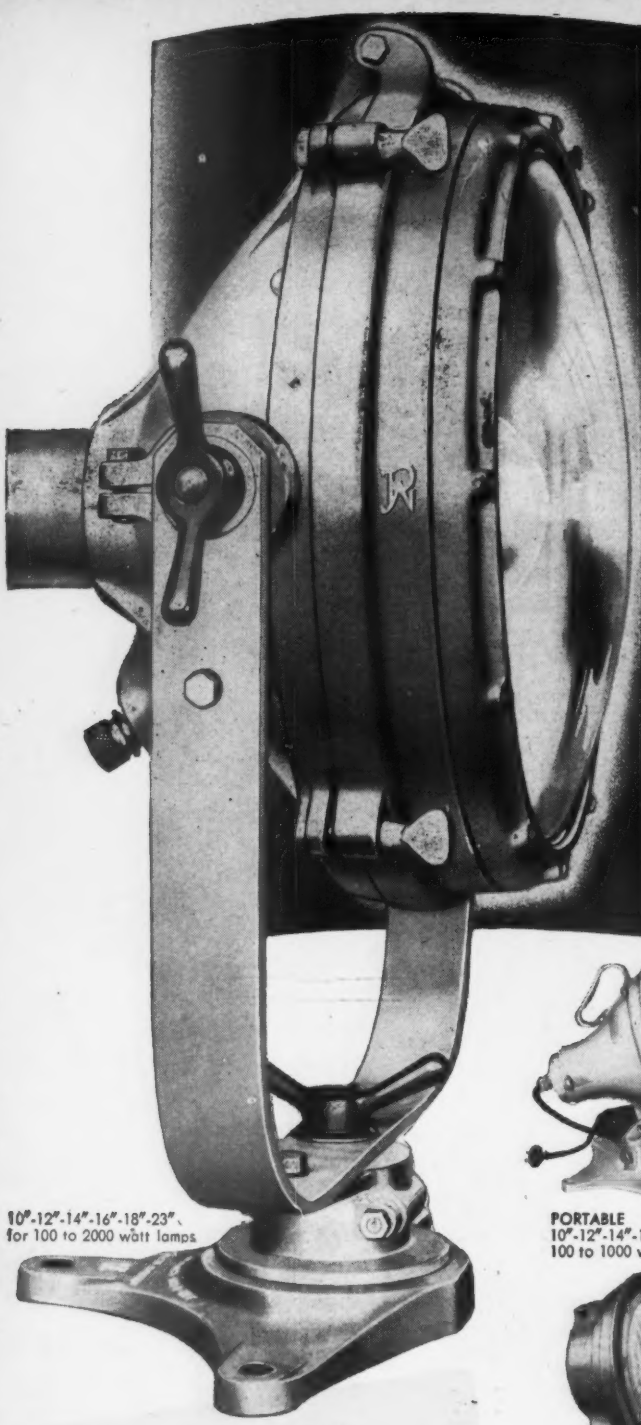
What's more, there's almost no chance for trouble in Federal Noark Motor Starters. There's only one moving unit and that *rides on ball bearings*—an exclusive Federal feature!... Important, too, Federal permits the choice of getting automatic or manual reset instantly... simply turn a knob and you've the type of overload protection that you want.

Order Federal Noark Motor Starters from your Federal Distributor. And write us for free copies of the "Federalog" and "Simplified Motor Control" giving full descriptions. Federal Electric Products Company, 50 Paris St., Newark 5, New Jersey.

FEDERAL NOARK

MOTOR STARTERS

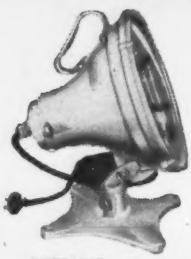
Complete line of Federal Electric Products includes Motor Controls, Safety Switches, Service Equipment, Circuit Breakers, Panelboards, Switchboards, Bus Duct ★ Sales offices in principal cities.



10"-12"-14"-16"-18"-23", for 100 to 2000 watt lamps

Specify PYLE-NATIONAL FLOODLIGHTS

for Permanent Heavy-Duty Floodlighting



PORTABLE
10"-12"-14"-16"
100 to 1000 watts

FLUSH—10" for Pit or Subway Wall or Ceiling
100-150-200 watts

SHORT RANGE—10"-12" for Wall Mounting
100-150-200 watts

Dependable Floodlighting with Minimum Maintenance

Pyle-National floodlight equipment is designed and constructed to withstand the most severe operating conditions. Complete range of types and sizes are available.

RUGGED cast aluminum housings with tight sealing doors and door glass joints—positively dust proof and moisture proof—give maximum protection to reflectors and lamps and reduce cleaning and other maintenance to an absolute minimum.

STRONG, galvanized cast iron bases and brackets of many types are provided for simple mounting and accurate adjustment in all locations.

ADVANCED DESIGN of the carefully molded and highly polished reflectors and lenses insure the highest optical efficiency—thoroughly annealed for maximum toughness.

Write for catalog 2100 giving complete information.

The services of our trained and experienced floodlighting specialists are available at all times to advise and assist in installation problems.

SINCE 1897

THE PYLE-NATIONAL COMPANY

1344 NORTH KOSTNER AVENUE, CHICAGO 51, ILLINOIS

DISTRICT OFFICES and REPRESENTATIVES in Principal Cities of the United States

CANADIAN AGENT: The Holden Co., Ltd., Montreal • EXPORT DEPARTMENT: International Railway Supply Co., 30 Church St., New York

CONDUIT FITTINGS • PLUGS and RECEPTACLES • TURBO-GENERATORS • LOCOMOTIVE HEADLIGHTS • MULTI-VENT AIR DISTRIBUTION

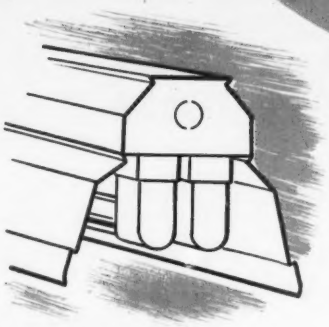
NOW!

Rounding out the line of

Wheeler

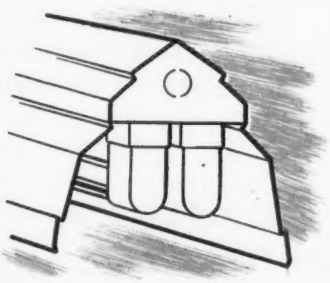
"SKILLED LIGHTING"

...New SLIMLINE Fluorescent Fixtures



INDUSTRIAL UNITS

End view of industrial type unit showing flat top. These units are designed for general industrial use under normal atmospheric conditions.



TEXTILE UNITS

End view of textile mill unit showing peaked top especially designed to eliminate frequent cleanings and to offer outstanding protection against humidity.

THIS SMART-LOOKING SLIMLINE fixture offers you more than just sleek beauty . . . it also offers a genuine "Skilled Lighting" unit for use with the new high efficiency SLIMLINE Lamps. Assures extra long service life with minimum maintenance.

Typical of Wheeler engineering thoroughness is the exclusive auxiliary lamp support at center of the fixture to prevent vibration of the 8 foot lamps. Fixture channel is in one piece . . . available in either baked enamel or Wheeler triple-guarded *vitreous porcelain enamel* finish. Reflectors are furnished in vitreous porcelain enamel finish only.

TWO TYPES: INDUSTRIAL-TEXTILE

The new Wheeler SLIMLINE is made for regular industrial application or for textile mill application. Textile mill units have peaked channels to prevent accumulation of fly, lint, dust and moisture.

HIGHEST EFFICIENCY

SLIMLINE lamps operate at the highest efficiency of any lamps. They start instantly . . . no special ballasts needed. If increased intensity is desired, 300 MA ballast is available to replace 200 MA ballast using same lamps.

EASIEST TO HANDLE

SLIMLINE fixtures have only 2 sockets . . . lamps have only 1 terminal pin in each end. Only two 8 foot lamps for a double-length fixture. Get all the facts on the extra value of these new SLIMLINE Units. Write to **Wheeler Reflector Company, 275 Congress St., Boston 10, Massachusetts.**

Distributed Exclusively Through Electrical Wholesalers

Wheeler REFLECTORS

SKILLED LIGHTING

MADE BY SPECIALISTS IN LIGHTING EQUIPMENT SINCE 1881

O. Z.'s *NEW* ALL-BAKELITE BUSHINGS

BEST BY TEST!

Results of Independent Laboratory Tests*

TORQUE ..... **O. Z. *PROVED 36% STRONGER*** than other bakelite bushings tested.

IMPACT ..... **O. Z. *PROVED 44% STRONGER*** than other bakelite bushings tested.

TENSILE STRENGTH .... **O. Z. *PROVED 112% STRONGER*** than other bakelite bushings tested.

FLAT COMPRESSION .... **O. Z. *PROVED 32% STRONGER*** than other bakelite bushings tested.

Now O. Z. offers you the strongest all-Bakelite insulating bushings made — 56% stronger overall than other Bakelite bushings tested in independent laboratory tests (results above) — they bounce like a ball if dropped, won't break even on concrete. And for fast, easy installation and permanent protection, O. Z.'s provide these *plus* features:

- **Smooth, rounded edges completely protect wire insulation during pulling and when in service.**
- **Clean, deep threads let you spin-on the bushing with a twist of the wrist.**
- **Ribbed outer surface provides a grip for slippery hands and permits tapping with screw driver.**

O. Z. Bakelite bushings cost no more than other Bakelite bushings, are fully approved by Underwriters' Laboratories and are available in sizes from ½ inch to 6 inches. Samples sent on request.

**Name and photostatic copy of report will be furnished if you wish.*

NET TRADE PRICES

Cat. No.	Pipe Size	Std. Pkg.	Ctn. Qty.	Lbs. Wt. Per 100	Less Carton Price Per 100	Carton Qty. Price Per 100	Std. Pkg. Price Per 100
A-50	½"	400	100	1½	$ 4.60	$ 3.60	$ 2.90
A-75	¾"	400	100	2	5.75	4.50	3.60
A-100	1"	200	50	3	9.20	7.20	5.75
A-125	1¼"	100	25	4½	26.50	20.30	16.25
A-150	1½"	100	25	6½	30.00	23.40	18.75
A-200	2"	40	20	9	36.00	28.10	22.50
A-250	2½"	20	20	14	58.50	—	36.50
A-300	3"	10	10	18	64.00	—	40.00
A-350	3½"	10	10	22	80.00	—	50.00
A-400	4"	10	10	25	96.00	—	60.00
A-500	5"	5	5	34	210.00	—	130.00
A-600	6"	2	2	45	400.00	—	250.00

CONDUIT FITTINGS • CABLE TERMINATORS
CAST IRON BOXES • GROUNDING DEVICES
SOLDERLESS CONNECTORS • POWER CONNECTORS

Buy O.Z. and you'll see why Engineers say, "They're O K if they're O.Z."

4820

O.Z. ELECTRICAL MANUFACTURING COMPANY, INC.
262 BOND STREET · BROOKLYN 2, N. Y.

JANUARY . . . . at a Glance

The New Year

Optimism over the outlook for 1949 is indicated by most of the current signs in the electrical business. Achievement of market potential may be restrained by continued shortage of critical materials, a phrase none of us thought we would be using three years after the war. Last month's power peak set a new record. Construction backlogs are still enormous. The upward trends show signs of leveling off. From year-end reports and reviews of 1948 construction, we have projected the probable pattern for the new year in "Outlook for 1949." If the prevailing trends are borne out in the coming months, this year of 1949 will again set new all-time records in electrical construction, installation, maintenance and repair.

NECA Looks Ahead

The annual meeting of the National Electrical Contractors Association in Miami Beach last month drew more than a thousand delegates and guests from all over the country to one of the greatest industry meetings on record. The concensus of outlook was optimistic and the program was largely devoted to forward-looking and progressive association policies. Beginning on page 49, our staff covers the NECA Convention in text and pictures.

Cooperation

One of the important aspects of modern lighting application is the coordination of lighting equipment with other mechanical features of the space. Lighting often requires cooperation between the architect, air conditioning engineer and lighting specialist to achieve the required artistic design and high efficiency necessary for the lighting and the other mechanical apparatus. F. Honerkamp, Chief Engineer of the Anemostat Corporation of America, discusses this important subject in his article, "Air Conditioning and Lighting," beginning on page 46 in this issue.

Intercommunication

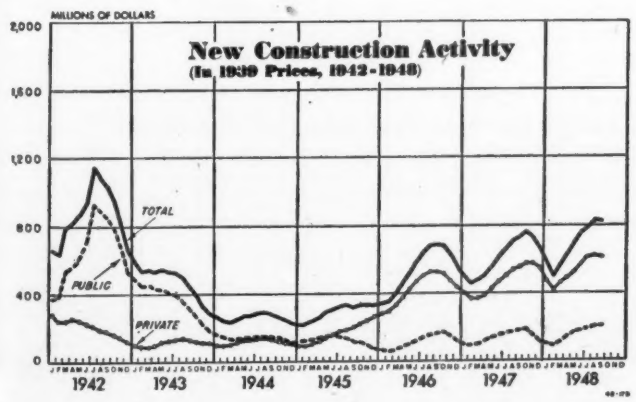
One of the aspects of electrical work that has had far too little emphasis in recent years is the intercommunicating telephone. Convenient, useful, and efficient systems for intercommunication are often essential features of many wiring projects. Beginning on page 56, in his series on signalling and communication, A. A. Schuhler discusses intercommunicating telephone layout.

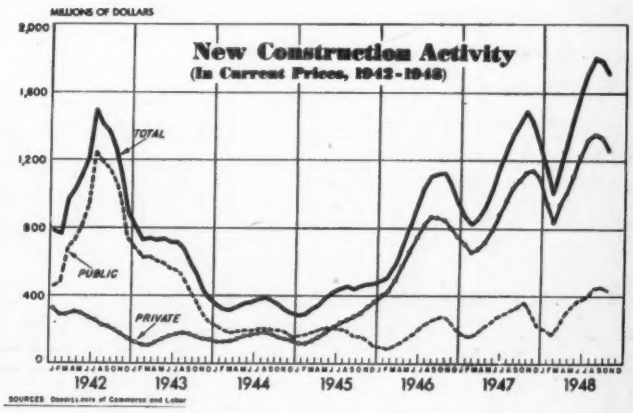
Materials Handling

The outstanding feature of manufacturing technology over the past couple of years has been the enormous increase in systematic and mechanized materials handling. Much of this progress is built around the efficient use of industrial trucks, particularly electrically operated materials handling equipment. The use of battery-operated vehicles has brought with it a need for battery-charging facilities of many types and a thorough knowledge of battery-charging practice on the part of the electrical maintenance department. J. J. Unger, Assistant Chief Engineer of the Electric Products Company, discusses the principles of battery-charging for industrial electrical men in the Industrial Electrification section this month. His authoritative article is both timely and practical.

Lighting Exposition

Big news in the lighting industry will be made by the Third International Lighting Exposition in Chicago March 29 through April 1. Many new lighting products will make their bow for the first time when the show opens. Says NECA President, R. W. McChesney, "It is the place to go to see and study lighting." Says NECA Exec. V. P. Paul Geary, "The need is mutual; lighting is indispensable to the electrical contractor; the electrical contractor is indispensable to lighting. Bringing to the lighting industry product, technique, competition and exchange of ideas, the exposition and conference is of vital importance and interest. . . ." Make your plans to attend now.





Your Good Name Deserves Another...

Densheath*

PLASTIC-INSULATED BUILDING WIRE

- Light weight, small diameter
- Permanent colors
- High abrasion resistance
- High tensile strength
- Resistance to common acids, alkalies, oils
- Low moisture absorption. Approved by Underwriters for wet locations (TW) and in oil
- Fire resistance
- Long-aging
- Easy to pull through conduit
- Free-stripping

DENSHEATH Building Wire, with the thermoplastic insulation pioneered by Anaconda long before the war, is long-aging, will not support combustion, is impervious to acids, oils, alkalies ... building wire worthy of the finest reputation.

Densheath's smooth, slick finish with no braid resists abrasion, pulls through conduit easily. Small diameter means more copper per conduit. Insulation is quick to strip. Permanent, bright colors mean quick circuit identification. The answer: *lower cost per foot of wire installed.*

Recognized by the National Electrical Code for circuits up to 600 volts and temperatures to 140° F.... and for wet and oily locations... Densheath Building Wire combines all the plus qualities that assure complete satisfaction.

4N674

*Reg. U. S. Pat. Off.

ANACONDA
from mine to consumer

DENSHEATH TYPE TW BUILDING WIRE

ANACONDA WIRE & CABLE COMPANY

25 Broadway, New York 4, N. Y.

PROGRESS WON'T WAIT

MOST OF US CAN FIND, deep in a back file, a slightly yellowed envelope marked "Postwar Plans". Behind the preparation was hope, vigor, and a compelling need for creative action. They deserve to be dusted off occasionally and reviewed.

IN THE ELECTRICAL INDUSTRY the years since the war have brought far different problems and policies from those we thought would prevail. No power surplus has appeared to inspire active load building. No soggy inventories have whipped up ingenuity and engineering progress. Delivery commitments can often out-weigh price or design in competition.

SUPPLIES OF STEEL and shortage of skilled men may have a greater influence on this year's electrical business than construction backlogs. Our industry may be classified among the most fortunate, because we cannot meet demands for some time to come. The prospects for steady employment and adequate profit over the short term could hardly be better.

FOR THE LONG TERM, however, the current prosperity in the industry should sound a warning. We are not enjoying it through engineering progress or comprehensive market development. We have been living on accumulated backlog and a rising tide of demand for electrical products, and in a dynamic economy, those who stand still, however prosperously, are rapidly losing ground. The most notable symptom of future trouble is in the wide gap between the frontiers of progress in the industry and the conventional work that is carried out in every community. With all the tremendous advance in lighting technology in recent years, much prevailing work along Main Street shows little evidence of it. Usually, an orderly array of uninspired fixtures produced an almost accidental lighting result. In wiring, too, though great progress has been made in specialized materials and methods, the chances are the average job will go on precisely like any similar project of a quarter of a century ago.

WITH MATERIALS AND MANPOWER holding a tentative ceiling over market prospects for the coming year, our industry has a unique opportunity to forge ahead through aggressive progress, in materials, application, and modern methods. New standards can be established and new values can be achieved. If the potential demand for electrical work cannot be fully met with available resources, we have a clear responsibility to make the most progressive and effective use of the resources we have.

THE COMING YEAR presents a challenge to the best engineering and management resources in the industry. Some inspiration may be found in long-buried postwar plans. The spirit and courage of their making is needed even more today.

Wm. F. Stuart

LIGHT

to please your customers!

You're sure "via Graybar"

Graybar has the biggest selection of lamps and lighting units available anywhere. They're all dependable products of leading manufacturers. So you can eliminate "shopping around," by standardizing on Graybar as your source of lighting equipment for all your customers' needs. You're sure of getting satisfactory units, and on-time deliveries as well.

Real Planning Aid

A Graybar Lighting Specialist will gladly give you all the help you want in analyzing your customers' illumination needs and in planning the best systems to meet them. His know-how is backed by Graybar's experience in studying, planning, and supplying lighting systems of every type since Edison invented the light bulb.

Everything for Contractors

From this one source—Graybar—you can get not only everything for lighting (including switches, ballasts, wire, and conduit), but also everything your customers need for ventilation, signaling and intercommunication, power, wiring—plus electrical contractors' tools!

Your Graybar Representative, or our nearest office, is your easiest source of up-to-the-minute facts about anything for electrical construction or maintenance.

Local Deliveries

Many of the items you need are in stock at our nearest warehouse and will be delivered promptly wherever you specify. *Graybar Electric Company, Inc. Executive offices: Graybar Building, New York 17, N. Y.*

4891

IN OVER 100 PRINCIPAL CITIES

You get the best of everything electrical

Via Graybar

TREND POINTERS

ELECTRICAL CONSTRUCTION, installation, repair and maintenance may go over 2 billion mark in 1949.

CONSTRUCTION EXPENDITURES were up 31 percent in 1948 over 1947 with upward trend continuing.

PUBLIC HOSPITAL and institutional construction is up 136 percent, private commercial up 60 percent, private residential up 45 percent.

NUMBER EMPLOYED by construction contractors is up 6.3 percent. September 1948 total was close to 2,239,700 workers.

WHOLESALE PRICES of building materials at year end were up about 11 percent.

AVERAGE WEEKLY EARNINGS in electrical work during September 1948 were $85.52, year ago $79.92.

UNION HOURLY WAGES on electrical work, on base of 100 in 1939, were 154.4 in 1948.

APPRENTICES in electrical work moved up from 17,200 in October 1947 to 18,900 in October 1948.

OUTLOOK FOR 1949

Record electrical construction dollar volume, expanding market development in all phases of electrical work are predicted. Appraising trends and prospects for the year ahead.

By W. T. Stuart

CONSTRUCTION dollar volume, cost levels and the comfortable profit position of the last year in electrical construction work looks like the crest of a boom. If it is, the projection of trends into the new year must be hedged with caution.

Dollar values, however, are apt to distort comparisons with past experience unless they are used with full appreciation of their limitations. For example, if a house wiring contractor wired 100 homes at $250 each back in 1938 for a total of $25,000 and the same number in 1948 at $500 each for a total of $50,000, we could say that his business had doubled. Actually, only the measuring stick had changed, the dollar had halved in value. Once the deficiency is recognized, however, and allowed for, dollar values are a thoroughly useful means of appraising and projecting future markets and drawing comparisons with the past.

The example is simplified for emphasis. The actual increment in house wiring prices averages between 109 and 136 percent over 1938 depending upon the area, type of wiring system and some other minor influences.

The clues to dollar value distortion are found in physical volume, (in the above example the physical volume remained the same). On our "At A Glance" page, we carry the current curves of total construction dollar volume and volume adjusted to 1939 prices as a key to current physical volume. And both are necessary if we want to appraise the coming year with reasonable accuracy.

Is 1948 construction the crest of a boom? In dollars it looks suspicious. Estimated totals run to 17.8 billion dollars for new construction, way beyond any previous year. In physical volume, however, it was exceeded by 1942 and by several years in the '20s. Only about 8½ percent of national income is going into construction against a former "normal" of 10 to 15 percent.

If we disregard, for a moment, the impressive dollar volume totals, we find nothing to indicate the crest of a boom. We cannot even find the boom (which should be evidenced at least by a greater than normal physical volume).

So far as electrical work is a fraction of construction industry totals, the same considerations hold, but with the vitally important differences due to the increments which result from increased use of electricity. The physical volume

of past years like the '20s, are wholly inadequate as an index for today. The fraction of total construction volume has increased substantially.

With these factors in mind, the tremendous dollar volume projections for 1949 are in better perspective.

Construction Forecast

Department of Commerce and Department of Labor estimates for 1949 are optimistic. Total new construction is expected to reach 18¾ billion dollars to set a new record dollar value for construction activity. The estimate represents an increase of more than 5 percent over the $17.8 billion figure now in prospect for 1948. The physical volume of construction in 1949, however, will apparently be about the same as in 1948, and will thus remain appreciably below previous records for the physical volume of new construction set in the 1920's and in 1942.

For new private construction the 1949 outlook is for a dollar value total of $13¾ billion, substantially the same as the total which it now appears will be reached in the present year. New public construction in 1949 is estimated at $5 billion, an increase of almost $1 billion—or 24 percent—over the total for 1948.

Private nonfarm residential construction will continue to be the largest single component of new construction and, at $6.5 billion, is expected to constitute about 35 percent of the total. This estimate represents, however, a decline of more than 8 percent in comparison with the figure of $7.1 billion for 1948.

Aside from residential building, most of the principal components of new private construction are expected to increase. Private nonresidential building as a whole is estimated at just over $4 billion in 1949, an increase of 12 percent over the probable total for 1948. This increase in total private nonresidential building results from an estimated 15 percent increase in commercial construction (warehouses, office and loft buildings and stores, restaurants and garages) and a 35 percent increase in "all other" private nonresidential building, which includes private educational buildings, churches, hospitals and social and recreational buildings. These expected gains are only partially offset by an expected 6 percent decrease in industrial construction. Privately owned public utility construction is expected to reach $2.75 billion, a rise of 8 percent over the total for 1948.

Almost half of the increase in public construction is due to an anticipated 42 percent increase in public nonresidential building, to a total of $1,375 million —an increase due largely to substantial advances in hospital and institutional buildings and in educational construction.

The Department of Commerce outlook for new construction in 1949 is derived from considerations of the present level of the various types of construction, their recent trends, and forces which are currently operating to affect their future.

In the case of residential construction, the figures for value of work to be put in place next year are based on an estimate that construction will be started in 1949 on about 875,000 new permanent dwelling units (private and public). Practically all of this total will be privately-owned, with the number of publicly-owned units to be started in 1949 estimated at only about 30,000, largely in purely State and municipal programs and in military installations. The 1948 volume will be about 925,000 units, of which not more than 15,000 will be publicly owned. In the estimate for 1949, of course, no allowance could be made for any further residential construction that might result from possible future housing legislation.

In addition, certain specific assumptions have necessarily been made. The more important of these are as follows:

1. It is assumed that no general business recession will occur in 1949.
2. It is assumed that expenditures for national defense and for foreign aid will not expand substantially above present levels, and that there will not be sufficient increase in demand from these sources seriously to affect the volume of materials available for domestic construction.
3. It is assumed that construction costs during 1949 will average about 5 percent above the average for the entire year 1948. Since costs in September, as measured by the Department of Commerce Composite Index, were already some 4 percent above the average for the first 9 months of 1948, the assumption for next year implies little change from current levels.

Electrical Work

Electrical construction projections in the accompanying table are based upon somewhat more conservative percentages of construction activity than we used last year. The outlook for electrical work is confidently optimistic if the construction predictions are approached. However, there is little to indicate much enthusiasm for market development in electrical construction. Persistent shortages in steel, shortage of top quality manpower and the relatively easy competitive situation has exerted, through 1948, a dampening effect on aggressive contractors. Power shortage, too, has pulled the punches of the utility load builders. The result is chronic underselling. Notable exceptions are "Adequate Wiring" promotion and "Planned Lighting" sales, both of which made substantial progress last year against considerable industry inertia.

The electrical construction predicted is $1.602 millions to which must be added at least 400 millions for remodel, alteration and changeover work, including relighting. The total runs just over the 2 billion mark if all goes well with the national economy this year.

Costs and Materials

Toward the end of 1948 costs were moving upward but at a very slow pace. Construction costs during September were 11 percent above September 1947.

Electrical materials are showing a tendency to level off; however this is a seasonal slackening. Additional price rises are likely for next year. Maybe 5 percent, probably more. But the wage-price spiral has not yet run its course.

Steel is a major bottleneck and copper supply a growing threat to project schedules. Manufacturers have ample productive capacity to meet 1949 demands within the fore-seeable availability of these materials.

Most irksome in price effects is the substantial quantities of "conversion" steel which must be used to eke out the critically narrow supply. Conversion involves expensive cross hauling and handling to take advantage of momentarily vacant nooks and crannies in the production mechanism of the steel industry and little relief is in sight.

Marshall plan and military requirement, though not yet a very large share of our production resources, must come off the top with less still remaining to divide among increasingly voracious industries.

B. W. Clark, president of the National Electrical Manufacturers Association and Westinghouse vice president, sees current demands promising a high level of electrical business through sev-

eral years. He says, "There is a world-wide surge of demand for electric service and electrical equipment, not only in America but also conspicuously in Canada, Great Britain, Western Europe, Mexico, and even China.

"This world-wide demand for products of the electrical manufacturing industry, the long-range expansion program of American electric utilities, and the high activity in residential, industrial, commercial and public construction promise to continue the high level of business for electrical manufacturers probably for several years to come and certainly through 1949.

"Next year will probably be as good for most electrical product lines as 1948—the largest volume year in the industry's history.

"Actual 1949 accomplishments will depend considerably on the steel and copper supply and on industrial peace in mining, transportation and manufacturing. For example, a labor disturbance that would reduce the supply of copper for a month might cost output of electrical products that could never be recovered during 1949. Steel has been and apparently will be even more critical than copper. Dislocation of supply could seriously affect production of generating equipment, switchgear, motors, transformers, and other industrial electrical apparatus and, particularly, electrical appliances.

"Probably 1949 will be the year in which supply of appliances will approximately match demand—a condition which has been expected since the end of 1947. The pronounced swing toward electric ranges and water heaters will probably postpone to a later date the matching of supply and demand in these lines. Farm and home freezers are a new line for which there is a rapidly increasingly demand. In part the supply of small appliances matched demand in 1948 and will in other lines of small appliances in 1949.

"Electrical building materials sales, with few exceptions, will be dependent only on the volume of actual 1949 construction and the copper and steel supply. The industry has ample productive capacity to provide requirements."

ESTIMATED NEW CONSTRUCTION ACTIVITY IN 1948 AND 1949
With electrical construction projected
(Millions of Dollars)

Type of Construction	Total Construction ###1948	Total Construction #1949	Electrical ##1949
Total new construction	17,775	18,750	1602
Total private	13,735	13,750	1303
Residential (excl. farm)	7,100	6,500	520
Nonresidential building	3,600	4,050	474
Industrial	1,380	1,300	195
Warehouses, office & loft bldgs.	350	450	45
Stores, restaurants & garages	910	1,000	120
Religious	230	325	23
Educational	245	325	33
Hospital and institutional	115	175	19
Social and recreational	215	275	19
Hotels and miscellaneous	155	200	20
Farm construction	500	450	36
Public utility	2,535	2,750	253
Railroad	350	350	21
Telephone and telegraph	675	725	65
Other public utility	1,510	1,675	167
Total public	4,040	5,000	299
Residential	65	150	12
Educational	525	700	70
Hospital and institutional	200	375	41
Other nonresidential building	245	300	30
Military and naval	150	175	17
Highway	1,550	1,700	51
Sewer and water	450	550	27
Misc. public service enterprises	105	125	6
Conservation and development	600	750	37
All other public	150	175	8

Joint estimates of the Department of Commerce and the Department of Labor.
First 10 months actual, last 2 estimated.
Electrical Construction and Maintenance estimates.

Power

According to a report by Ernest R. Acker, president of EEI, the electric industry in 1948 installed an unprecedented amount of new generating capacity, topped the record set in 1947 for the addition of new customers, and made substantial gains in electricity production over the peak attained in the previous year.

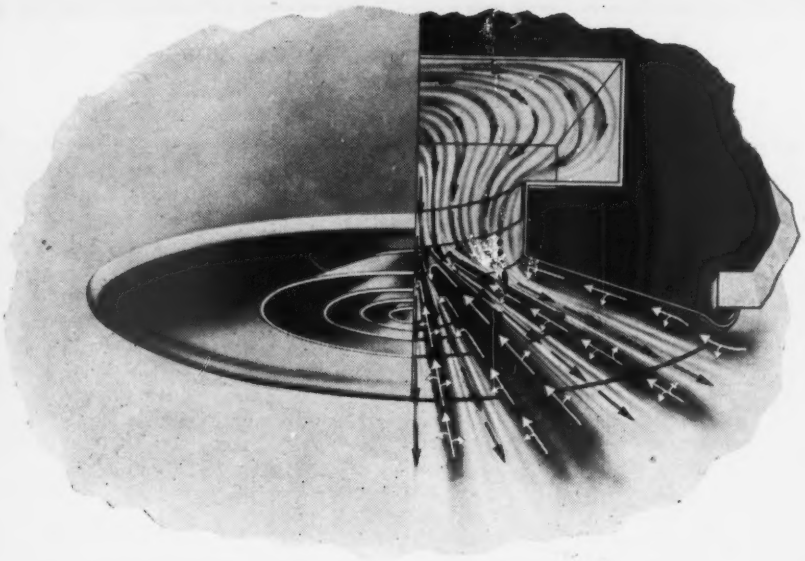
More than 4,000,000 kilowatts of new generating capacity were installed and operating by the end of 1948, as the electric industry's expansion program gained increased momentum. The added capacity represented the largest single year's increase in industry history, and brought the total generating capacity in service at the end of 1948 to over 56 million kilowatts, compared with 52 million at the end of 1947.

Electricity production by all the nation's generating sources totaled about 336 billion kilowatthours in 1948, surpassing 1947's record production of 307 billion kilowatthours by 29 billion, an increase over that year of about 9 percent. About 282 billion kilowatthours of the grand total were generated by the electric industry, while the remaining 54 billion were produced by industrial and railway plants for their own use. Generation by the electric industry showed a 10 percent increase over 1947 production, about 26 billion kilowatthours higher than the 1947 total.

With more than 2 million new customers coming on electric lines, 1948 topped by a slight margin 1947's record of new customers added annually. The industry now has approximately 40,800,000 customers, about 7 million of whom have been added since V-J Day.

These gains in electrical service were distributed throughout the nation in varying proportions, with some areas showing greater than average growth as a reflection of industry and population shifts accelerated by the industrial development of some regions during the war.

Business managed electric companies are expected to make an outlay of over $5 billions for some 15 million more kilowatts capacity in next three years.



PRE-MIXING OF SUPPLY AIR (black arrows) with about a third of its volume of room air (white arrows) is achieved in this air outlet, scientifically designed to reduce the high velocity supply air and to diffuse the mixture in a controlled, draftless pattern.

ORNAMENTAL LUMINAIRES are suspended from center of Anemostat in Commercial Natl. Bank, Shreveport, La.

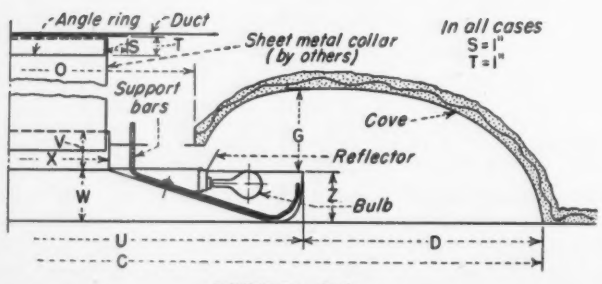
Air Conditioning and LIGHTING

By F. Honerkamp

Chief Engineer

Anemostat Corporation of America

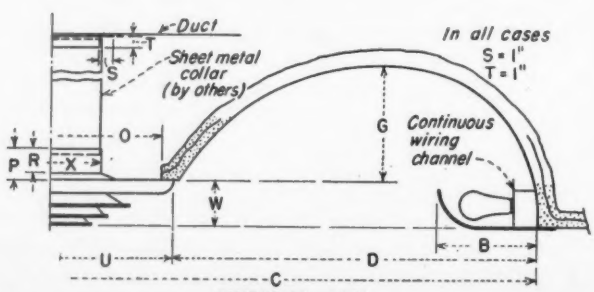
Cooperation between architect, air conditioning engineer and lighting specialist results in artistic design and high efficiency in both lighting and air conditioning systems



DIMENSION DATA

SIZE NO.	X	U	C	D	G	O	V	W	Z	NO. BULBS	MAX. WATT
20	8	30	78	24	9½	10½	2	2⅛	3½	12	720
25	10	36	84	24	10½	14	2	2⅝	3½	12	720
30	12	40	90	25	11½	16	2	3¼	3½	18	1800
35	14	46	96	25	12	20	2	3¾	4	18	1800
40	16	50	102	26	13	22	3	4 9/32	4	18	1800
45	18	53	114	30½	15	24	3	4 13/16	4	24	2400
50	20	55	126	35½	17	28	3	5 11/32	4	24	2400
55	22	60	132	36	18	30	3	5⅞	4	36	3600
60	24	60	132	36	18	32	3	6 13/32	4	36	3600
65	26	60	132	36	18	34	3	6	4	36	3600
75	30	60	132	36	18	38	3	5⅛	4	36	3600

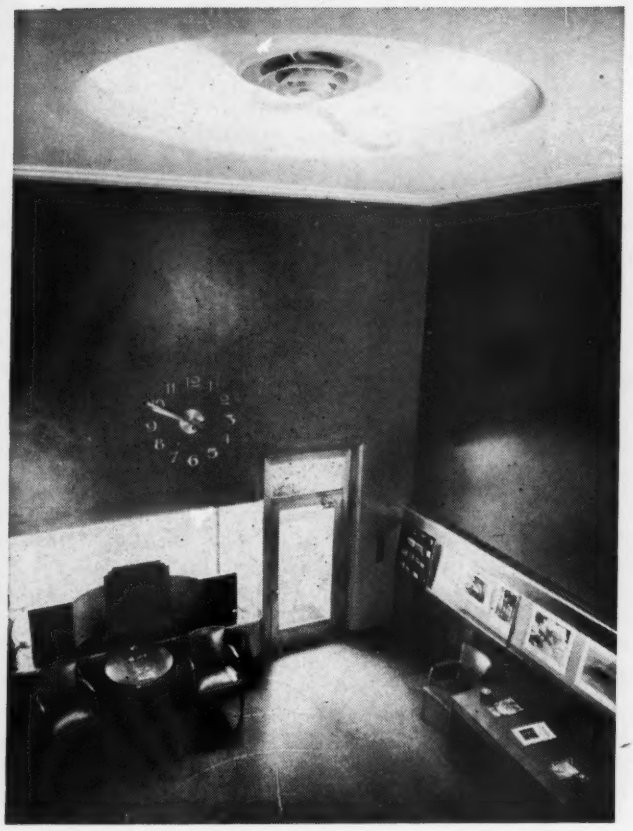
INDIRECT LIGHTING COVE at inner circle of ceiling dome is combined with Type CSL Anemostat.



DIMENSION DATA

SIZE NO.	X	U	C	D	O	B	R	G	P	W	WATTAGE 75W LAMPS	WATTAGE 100W LAMPS
20	8	20	78	29	18	8	2	9	2¼	3¾	3300W	4400W
25	10	25	84	29½	23	8	2	10	2¾	4¼	3900W	5200W
30	12	30	90	30	28	8	2	11	3⅛	4⅞	4200W	5600W
35	14	35	96	30½	33	8	3	11	4¼	5¾	4500W	6000W
40	16	40	102	31	38	8	3	12	4⅝	6⅜	4800W	6400W
45	18	45	114	34½	43	8	3	14	5⅛	7	5250W	7000W
50	20	50	126	38	48	8	3	16	5⅛	8	5850W	7800W
55	22	55	132	38½	53	8	3	17	5½	8½	6150W	8200W
60	24	60	132	36	58	8	3	17	5¾	9¼	6150W	8200W
65	26	65	132	33½	63	8	3	17	6½	9¾	6150W	8200W
75	30	68	132	32	66	8	3	17	7⅝	10½	6150W	8200W

INDIRECT LIGHTING COVE at outer circle of ceiling dome is combined with Type B Anemostat.



ILLUMINATED CIRCULAR DOME, with Anemostat in center, is cove lighted from outside diameter to provide pleasing effect in office of American Air Lines, New York City.

ANEMOSTAT FORMS CENTER FEATURE in large dome illuminated from suspended circular lighting unit in Forum Cafeteria, Chicago.

THE different types of light sources and the various types of lighting units which are available today, enable architects and designers to comply with the demand for better lighting in air conditioned stores, offices, schools, public buildings, hospitals, theatres, and industrial buildings.

In order to combine artistic design with quality air conditioning on the one hand, and quality and quantity lighting on the other hand, close cooperation between architect, air conditioning engineer and illuminating engineer is imperative.

Modern air conditioning controls the phenomena of nature for the service of man independently of weather conditions—it creates a healthy and comfortable indoor climate and thereby increases the pleasure and the efficiency of the occupants of the controlled environment.

Modern artificial lighting controls the phenomenon of light independently of daylight conditions. It serves to overcome short-comings created by our urban civilization and thereby similarly improves living and working conditions.

The combination of air conditioning and artificial lighting enables remarkable control of indoor conditions and has found its most interesting application in the gigantic windowless factories built during World War II and since its termination. In general, air conditioning and illuminating engineers, as well as builders and architects, who are the designers of conventional buildings during peace-time conditions, are collaborating in order to produce effective and appealing lighting, giving due consideration to costs and to the influence of lighting on cooling.

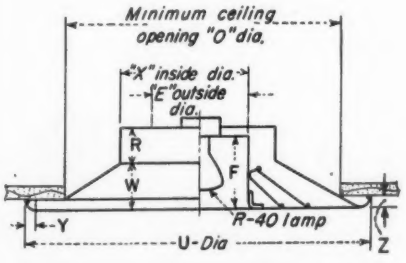
When the cooling system of an air conditioning system is designed, the effect of artificial lighting on the temperature rise must be considered, since all practical light sources generate heat. When a gas-filled incandescent lamp of the 300 to 500 watt size is operated at normal voltage in still air its energy distribution is about as follows:

Radiation in visible spectrum.11%
Heat as invisible radiation..70%
Heat conducted away by parts of lamp 3%
Heat dissipated by convection and conduction through gas 8%
Heat radiated by bulb..... 8%

It is well known that the essentials of good lighting require:

1. Adequate quantity for the particular seeing needs
2. Freedom from objectionable glare
3. Freedom from harsh shadows and brightness contrasts.

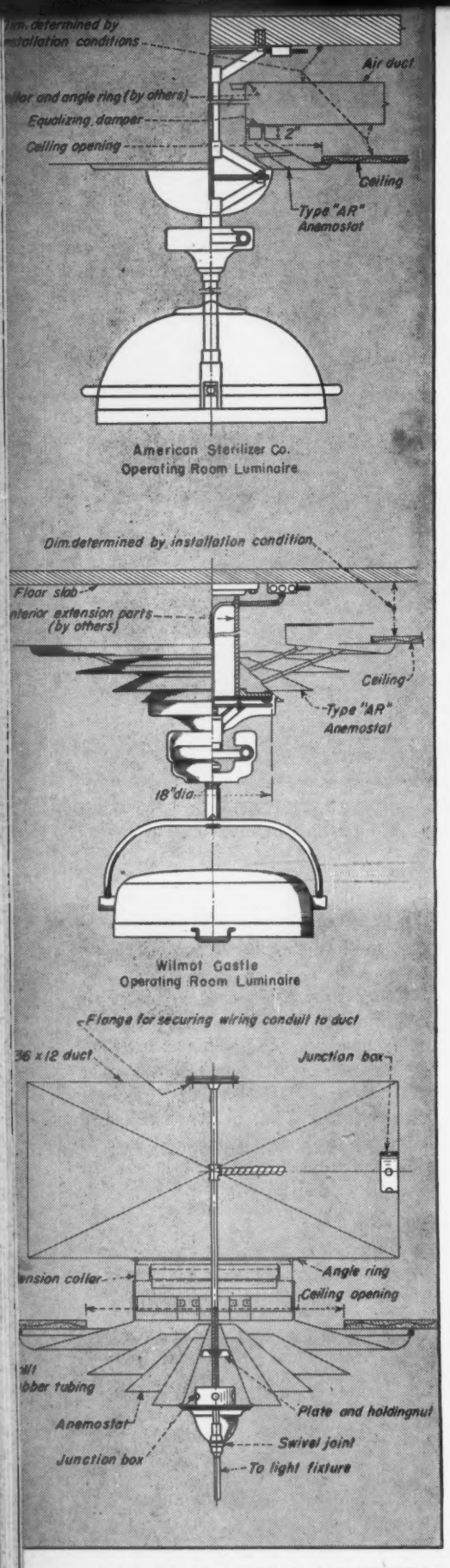
Each of the three types of light sources now in common use—incandes-



ALL DIMENSIONS IN INCHES

SIZE	E	F	O	R	U	W	X	Y	Z
30	9½	7½	23	2	27	2½	12	¾	¾
35	9½	7½	27	2	31½	2⅞	14	⅞	⅞
40	9½	7½	32	2	36	3⅞	16	⅞	⅞
45	9½	7½	36	2	40½	4	18	¾	1

REFLECTOR LAMPS, fixed or adjustable, can be installed in Anemostat.



TYPICAL MOUNTING AND WIRING details for luminaires suspended from Anemostat air diffusers. Many ceiling type luminaires may also be attached to the air diffuser units.

cent, mercury and fluorescent—has inherent characteristics suitable for specific uses. There is a great flexibility of choice and often satisfactory results may be obtained by use of any one of these light sources.

About 90 percent of the total energy from a clear-bulb, gas-filled lamp is therefore in radiant form, but not all of this radiant heat becomes a load upon the cooling system. A portion of it passes through windows and some of it strikes walls, ceiling and floor and is absorbed by the building structure. The latter is partially dissipated during cooler night hours. Nevertheless, engineers take into consideration the entire heat load given off by artificial lighting in calculating cooling load. Usually, this load is calculated by applying the factor of 3.42 B.t.u. per watthour in the total lamp wattage.

The function of the air outlets of a comfort air conditioning system is to diffuse the supply air in such a manner that temperature, humidity and air motion in the occupied zone are substantially uniform and that the air is moving constantly without creating drafts or pockets of stale air. The outlets should be noiseless and economical to install and operate—and they should blend, architecturally, with the structural and decorative design.

Many methods of introducing conditioned air into enclosures have been developed, but only few attain the required objective. In order to keep the cost of the air conditioning system within reasonable limits, large quantities of air have to be supplied by relatively small and simple ducts using a minimum of outlets. This calls for high velocity air distribution which is not possible with conventional outlets, such as grilles, registers, ceiling plaques and similar devices. If such outlets are employed the high velocity air sweeps the occupancy zone before mixing with the warmer room air, and before the velocity is appreciably reduced by entrainment of room air. This results in a drafty room filled with turbulent currents. Under such circumstances, temperatures vary throughout the room, humidity is unequalized and conditions generally unsatisfactory.

Such conditions can be avoided by using high velocity air outlets which reduce the velocity of the supply air in the outlet itself. The cold air supply and the warm room air are then merged well above the occupancy zone before the mass is diffused in a controlled, draftless pattern. The scientifically designed diffuser achieves this by siphoning up to 35 percent of the room air into its flaring metal cones and mixing this room air with the supply air within the device before the mixture is discharged and circulated at low velocities. Because this type of diffuser is circular, it merges pleasantly into the decorative scheme.

For many years, Anemostat engineers have given special attention to quality and quantity lighting for air conditioned enclosures. They have developed diffuser units which harmonize pleasantly with the decorative lighting treatment used in conjunction with both incandescent and fluorescent light sources, and at the same time give perfect air distribution even in cases where the lighting treatment is unusual or at variance with normal lighting practice.

There are many ways in which the air diffuser may be blended effectively with modern schemes of decoration. Since design principles for locating air diffuser outlets generally places these outlets at the same location as design principles for lighting locates individual suspended luminaires, the two may be combined by suspending the luminaire from the center of the air diffuser outlet. Where it is desirable to create varied and unusual lighting and decorative effects, the air diffuser can be made the center feature of illuminated circular ceiling domes, indirectly lighted. When low level lighting is adequate, the cove can be located at the inner circle of the ceiling dome as a part of the air diffuser unit, and when more light is needed than can be obtained from lamps installed around the circumference of the inner dome circle, the cove may be placed at the larger-circumference outer circle. The lamps in these coves may be wired for alternate control, thus providing for two or more intensities of lighting, or for unusual color lighting effects.

Type R-40 reflector lamps and other similar spotlight devices, either of the fixed or adjustable types, may also be concealed in the center section of air diffuser outlets to provide accent lighting on displays in stores, theatre lobbies, and similar locations.

These and other similar combinations of air diffusers and lighting techniques are extremely valuable to the lighting engineers, the architect and the air conditioning expert in solving ordinary and difficult lighting and air conditioning design and installation problems.

NECA

Convention Report

Electrical construction industry leaders see good year ahead; recommend accelerated depreciation to spur housing; emphasize need for continued research and a management training program; approve articles of incorporation at the Annual Meeting of the National Electrical Contractors Association. McGraw Award presented to Laurence W. Davis; NECA Apprenticeship Medal awarded to Robert M. Hutchinson.

DESPITE war tension, the prospects for continued inflation and other disconcerting surface trends, the electrical construction industry can look to another $1½ billion volume next year. That was the concensus of industry leaders who addressed more than 1,000 delegates at the 1948 Annual Meeting of the National Electrical Contractors Association at the Roney Plaza Hotel, Miami Beach, Florida, Nov. 24-Dec. 3. Next year may require some important adjustments with the possibility of new labor legislation and a new tax picture. Any moderation of the abnormal boom will not indicate a recession, but a return to normal competitive conditions where aggressive sales effort will be required.

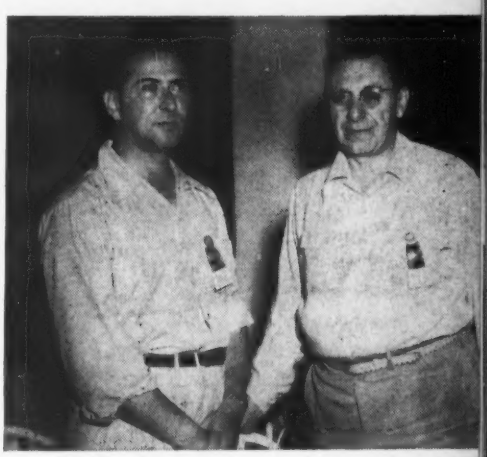
To stimulate private housing, the contractors recommended, by way of resolution, accelerated depreciation allowance in income tax returns as a means of encouraging private capital. Possible issuance of certificates of necessity by Commissioner of Internal Revenue to qualified Corporate investors to large scale rental property, on which construction began before January 1, 1950, was advocated. Such tax consideration could be applied to debt reduction on the projects and hence afford lower rentals.

General theme of the conference was "What About Tomorrow?"—the title of President R. W. McChesney's address at the opening session. Within the next nine years, the United States will be using 375 billion kilowatt hours of electricity annually, a 60 percent increase over present consumption. Mr. McChesney sees a 60 percent increase in heavy industrial electrification; a 65 percent increase in light industry and commercial use; a 250 percent increase in farm electrical use and a 66 percent increase in residential consumption in that period. To control this business, electrical contractors must aggressively develop it, Mr. McChesney warned. NECA's goal, he added, is to get enough qualified business men contractors in the field to fill the many vacuums in the distribution, installation and servicing of electrical equipment and materials. Today, there are 10,000 electrical contractors large and stable enough to regularly employ more than 100,000 skilled mechanics and handle more than $700 million worth of electrical equipment and materials, he revealed. To meet the future challenge, McChesney, outlined NECA's six-point program incorporating Public Relations, Research, Employee Relations, Membership, Personnel training and Government Relations.

Training of Management Personnel is up to NECA, Mr. McChesney believes. He advocated establishment of

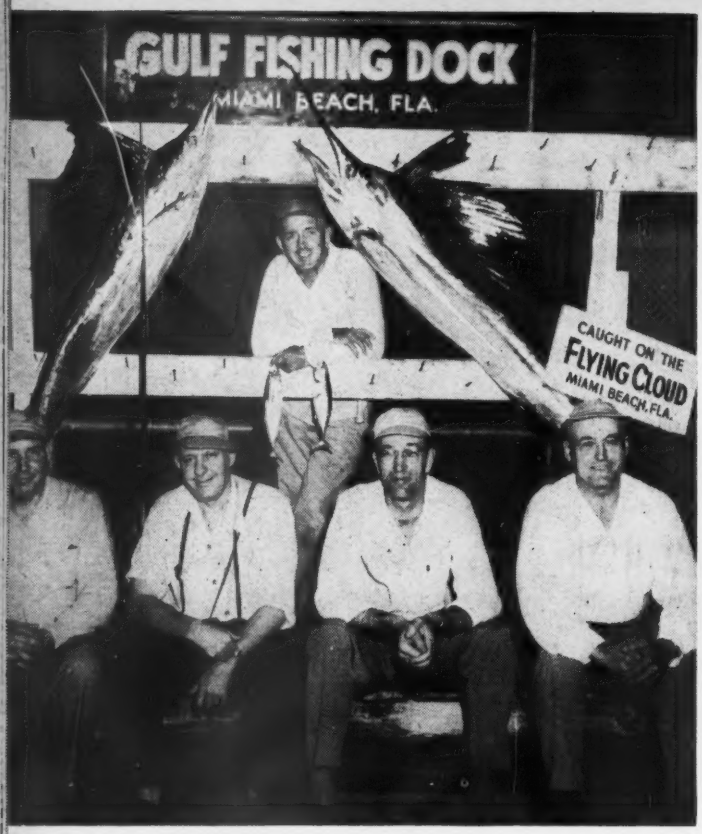
Col. O. R. McGuire, Counsel, NECA, and R. W. McChesney, president, NECA, Harry Alexander, Inc., both of Washington, D. C.

D. B. Clayton, Electric Constructors, Inc., Birmingham, Ala. and W. B. Schnorbus, W. B. Schnorbus Electric Co., Houston, Texas.



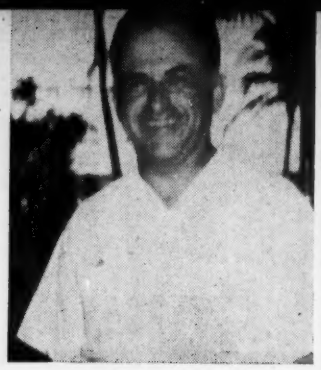
W. E. Frazer, H. B. Frazer & Co., Philadelphia, Pa. and T. L. Rosenberg, T. L. Rosenberg Co., Oakland, Calif.

J. Walter Collins, Manager, Chicago & Cook Co. Chapter, NECA, and F. E. Vogel, Edward Electric Co., both of Chicago.



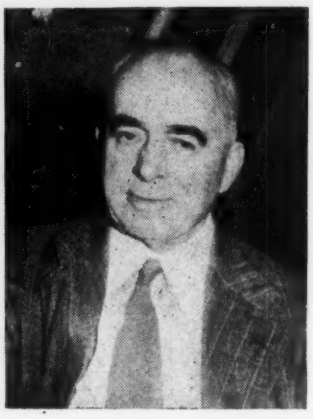
Ed Woestendiek, Hampton Electric Co.; T. C. Kaemmerlen, Kaemmerlen Electric Co.; Bill Spain, and Paul Wendt, Paul Wendt Electric Co., all of St. Louis, Mo.

John M. Nairn, Superior Electric Co., Jersey City, N. J.



S. C. Sachs, S. C. Sachs Co., St. Louis, Mo.

Edward J. Vanderlinde, Vanderlinde Electric Corp., Rochester, N. Y.



George F. Butler, Beacon Electric Engineering & Construction Co., Buffalo, N. Y.

a school to train young men in sales, engineering, estimating, expediting materials, procurement, job management and superintending.

NECA's Government Relations program is designed to keep members informed of Government activities that affect the electrical construction industry. New controls on materials, prices and finance impend. Labor law is in the state of change. Pricing policies are up for review. Legislation for a long-range public housing program is in the offing. Breathtaking military budgets and foreign aid that competes for men and materials will bear a high tax tag. Another round of wage increases is expected. All of these are part of tomorrow's picture, he concluded.

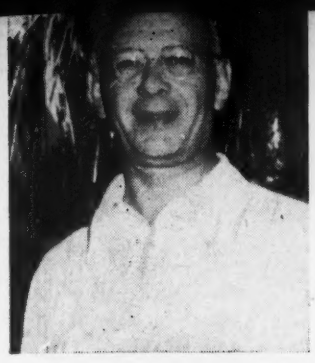
George W. West, chairman of the Construction and Civic Development Department Committee of the Chamber of Commerce of the United States urged intensified cooperation between all units of the Construction Industry to avert governmental domination. He proposed aggressive pursuit of four tasks for joint industry action through the Chamber of Commerce Construction Industry Advisory Council. These are: (1) Publicizing the Construction Industry story; (2) developing better factfinding facilities to accurately and quickly determine the nature, volume, location and need for building; (3) achieving greater industry stability by providing cushions against depression and boom through advance planning of private and public construction operations; (4) establishing an agency —the Building Research Advisory Board of the National Research Council—to gather, study and advise the industry and the public of research developments in the building construction field.

The architect and contractor are leaders in an industry which accounts for 15 to 20 percent of our total general economy, stated E. R. Purves, Director, Public and Professional Relations of the American Institute of Architects. While discussing the role of the architect and contractor in the construction industry, he advised that the A.I.A. frowns upon architect-contractor combination enterprises. Architects are beginning to recognize the specialized knowledge an experienced contractor possesses in his field; realize the complexity and importance of electrical systems in modern structures and the need for more direct contact with the electrical contractor, Purves added. The cooperative relationship between the designer and the electrical contractor will be increasingly important in the future, Purves asserted.

Trade associations helped the government mobilize the nation's war potential by utilizing the specialty contractor's know-how, skilled labor and equipment to best advantage Col. O. R. McGuire, NECA General Counsel, told the convention. They—and particularly NECA—are ready to do it again should an emergency arise. They already have been consulted by the National Security Resources Board in formulating a plan of industrial mobilization for emergency action. Trade and labor associations are firmly entrenched in our economic structure; have become an integral part of our representative government, McGuire added. In this capacity, they are in a position not only to educate their members but also to aid and assist legislative and administrative officers when questions pertaining to specialized fields arise. Some 8,200 associations were listed in a 1938 survey, he revealed.

Line Construction Market

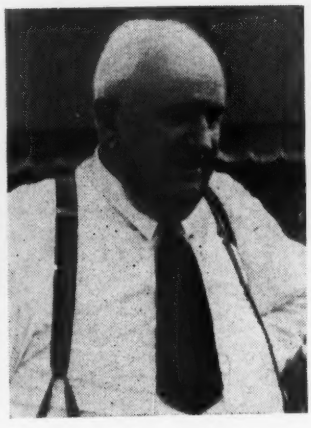
Another glimpse of what the future holds was presented in the NECA Line Constructors Report. A $2 billion market in outside electrical work looms ahead, reported D. A. Fleming. In 1948, public utilities will have built



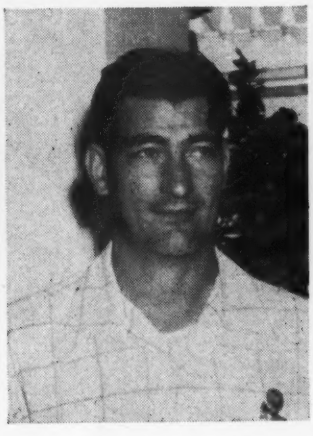
H. F. Fischbach, Fischbach & Moore, Inc., New York City

George Gamp, Gamp Electric Co., St. Louis, Mo.

George E. Davis, A. L. Davis Co., Newark, N. J.; A. Herrmann Wilson, Electrical Construction Co., Inc., Washington, D. C.; Thomas J. Fleischer, Atlanta, Ga. and C. R. Wright, Wright-Cason Electric Co., Knoxville.



A. C. McWilliams, McWilliams Electric Co., Chicago, Ill.



Robert M. Hutchinson, Althoff-Howard Electric Company, Evansville, Ind.

Alex S. Hastings, Patterson Electric Ltd., Toronto; C. Howard Simpkins, C. Howard Simpkins, Ltd., Montreal, Alex G. Moore, Patterson Electric Ltd., Montreal; and George W. Patterson, Patterson Electric Ltd., Toronto.

14,105 miles of transmission line, 11-kv. and up. Their prospective expenditures for increased substation capacity in 1948 is $271,347,000. They plan to build 51,195 miles of rural distribution lines at a cost of $11,686,000. Other public power agencies have spent millions and are likely to substantially increase their expenditures in the future.

Fleming revealed that REA has nearly $700 millions of lines not yet under construction; hope to have 120,000 miles of line under construction by the end of the fiscal 1948. During the calendar year 1947, some 91,000 miles of lines were energized. REA engineers estimate that $50 millions or more will be spent annually for the next 10 or 12 years on system improvement.

During the past year NECA has added 122 new members who do line work; now has 578 who are equipped to erect heavy steel towers and handle electrical equipment, NECA members do from 10 to 15 percent of private utility contract line work; less than five percent of REA line work. About 90 percent of REA work and a considerable portion of private utility work is done by open-shop operators.

To capture a larger share of this market NECA's Line Constructors Division are planning to organize sections with established Chapters.

Technical Session

The Dec. 2nd session, complete with open forum discussion, was devoted to research, estimating, labor units and installation practices. NECA Research Committee Chairman, A. C. McWilliams of Chicago outlined the broad objectives of this program designed to aid the contractor in establishing accurate job and operating costs. Present Data Tables for reducing estimating time will be continued; existing labor units will be compared with job costs and adjusted accordingly; operating cost studies will continue; hazards affecting labor units will be analyzed and suggestions made for customer approach and sales data presentations.

McWilliams revealed that the Committee is constantly studying manufactured products with an eye to recommending changes that will benefit the construction industry. Example: The external diameter of thin-wall conduit could be made the same as heavy wall to give 43 percent more area and permit interchange of all no-thread fittings. Possibilities of a new light weight intermediate conduit to take standard threads are being studied.

The feasibility of furnishing itemized bills of materials with each bid request are being investigated as a means of speeding up estimating. Mr. McWilliams urged all local NECA Chapters to establish their own Estimating and Research Committees to help his committee assemble all the data.

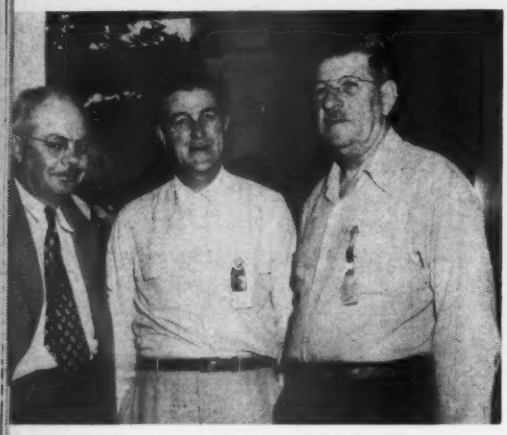
Research is not an attempt to regiment this or any other business, stated J. Walter Collins, secretary of the NECA Research Committee, Chicago It is a recounting and analysis of past practice designed to guide future activities. It should include customer approach, estimating, procurement, production provision and on through to satisfactory operation of an installation, he added. Considerable research has already been done in the electrical construction field, said Mr. Collins whose Chicago Chapter has spent some nine years and upwards of $30,000 in this type of work. Future direction of NECA research will depend upon suggestions and requests of Chapters, he continued. Biggest problem now is the development of a standardized approach that will encourage customer confidence and minimize such practices as direct employment, installation only, fixed fee, time and material, Collins concluded.

Electrical contractors must use good

R. S. Roman, Roman Electric Co.; W. J. Bentley, Bentley Electrical Co.; F. H. Oppitz, H. C. Adolphsen Electric Co.; and William Lisch, Lisch Electric Co., all of Milwaukee, Wis.

H. M. Schulman, A. S. Schulman Electric Co. and A. H. Keith, Westinghouse Electric Supply Co., both of Chicago.

H. F. Janick, T. H. Green Electric Co., Rochester, N. Y. and W. P. Collins, Collins Electric Co., Inc., Springfield, Mass.



E. C. Carlson, Carlson Electric Co., Youngstown, Ohio; Howard L. Miller, Utilities Engineering Co., Philadelphia, Pa.; and H. G. Miller, Miller Electric Co., Miami, Fla.

Bill Damon, NECA Representative District 7, David L. E. Ogden, Manager, North Central Chapter, NECA, both of Omaha, Nebraska

Ernest M. Higgins, Higgins-Callaway Co.; and Deronda Levy, Levy-Morton Co., both of Columbus, Ga.

installation practices, good planning and supervision to meet rising costs head-on, asserted Louis Kalischer, Brooklyn, N. Y. Give the men better tools and equipment if you want better production. Mr. Kalischer discussed the activities of the New York Joint Industry Committee's Coordinating Committee for Improved Installation Practices. These members, composed of contractors and top flight foreman (IBEW members) investigate new tools and equipment, recommend changes to manufacturers, gather efficient installation practice experiences and correlate all into handbook form for industry use. To date some 30 prizes and numerous honorable mention certificates have been awarded men for ideas submitted in this contest.

The wide spread in bid quotations indicates a possibility that sound estimating has become a lost art during the war years, Howard Pancoast, High Point, N. C., told the delegates. He urged intelligent use of the NECA Manual of Labor Units to assure accurate cost estimating; listed the following five factors of competent estimating procedure:

1. Determine exactly what must be done and under what conditions.
2. Make an accurate take-off. Include all details and proven short cuts.
3. Apply labor units from manual and make adjustments as per tabular notes.
4. Apply a job factor to adjust man-hours to actual job conditions.
5. Organize to follow through on a job by providing competent supervision and adequate budget control.

Quicker action on recommended National Electrical Code changes was forecast by George Andrae, Milwaukee, Wis., a member of the new Electrical Correlating Committee of the National Fire Protection Association. The old Electrical Committee setup was too large and slow to act and open to the abuse of "block" and "pressure group" voting, he added. Correlating Committee members are personal appointments made by the NFPA and not industry appointments. No organization has a vote on Code changes under the new setup which is an outgrowth of the wartime experience with the Emergency Electrical Committee. Serving on numerous Code Making Panels which report to the Correlating Committee are nine electrical contractor representatives, Andrae revealed. He urged development of NECA local code committees as an active function of each Chapter.

An open forum, led by Ray Ashley, NECA Research Director, concluded the technical session.

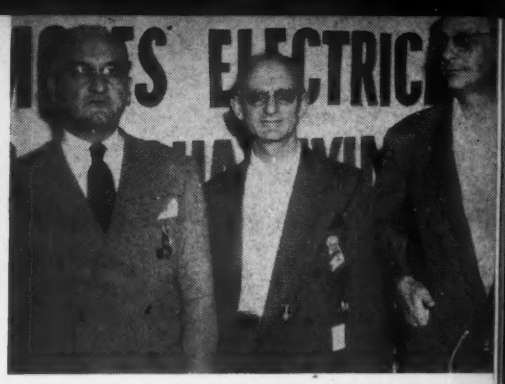
Honor Larry Davis

The Annual NECA Banquet on the evening preceding convention adjournment was held in honor of Laurence W. Davis who retired as treasurer of NECA after 29 years of service with the organization. President McChesney lauded "Larry" for his years of unselfish service to the organization and his contributions to the electrical construction industry in general. Although retiring from NECA, Mr. Davis will maintain his contact with the contracting fraternity in his position as executive secretary-treasurer of the National Electrical Benefit Fund.

Additional honor was accorded Mr. Davis when he was awarded the James H. McGraw Award Contractors Medal for 1948. Presentation was made by W. T. Stuart, editor of *Electrical Construction and Maintenance* and secretary of the Committee of Awards. The citation accompanying the award read:

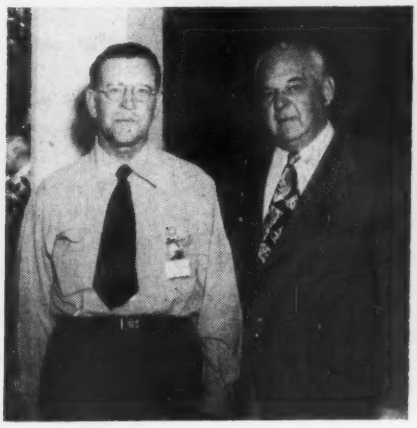
Russ Vierheller, Manager, St. Louis Chapter, NECA and A. G. Ofenstein, Ofenstein Engineering Co., Detroit, Mich.

E. C. Hewitt, sales manager, Thomas & Betts Co., Elizabeth, N. J. and Fred M. Shepard, district manager, Thomas & Betts Co., Atlanta, Ga.



H. M. Bryant, Bryant Electric Co., High Point, N. C.; A. D. Miller, Richardson-Wayland Electrical Corp., Roanoke, Va.; and L. H. Engleby, Engleby Electric Co., Roanoke, Va.

H. G. Richardson, General Cable Co., New York and A. G. Paves, Westinghouse Electric Supply Co., Baltimore, Md.



J. E. Mellett, J. M. Clayton Co., Atlanta, Ga. and E. E. Hedler, Manager Penn-Del-Jersey Chapter, NECA, Philadelphia

D. J. Crimmins, manager, New York City Chapter, NECA; Efram A. Kahn, E. A. Kahn & Co., Inc., Jamaica, N. Y.; and L. D. Kennedy, Greater City Elec. Contractors Assn., New York.

"Leadership is often recognized in great and unselfish effort toward the fulfillment of momentary and specific objectives. For some, however, recognition must be based upon a wider perspective in both time and scale of accomplishment for an accurate measure of the quality of leadership, and the quality of the man. Through many years of leadership, unfailing foresight, and unselfish devotion, Laurence W. Davis has brought unity, distinction and common purpose to an individualistic and highly competitive industry.

"For 28 years he has served the electrical contracting industry above and beyond the requirements of his office. For 24 years he served as chief executive officer of the National Electrical Contractors Association, setting as an example to his profession the highest standards of integrity, accomplishment and personal leadership.

"Under his direction the National Electrical Contractors Association has achieved national prominence as a leader in trade associations for the scope and quality of service it renders to its members.

"His vision has always encompassed the expanding role of his branch of the electrical industry in the plans and purposes of that industry. His persuasive leadership was largely responsible for enlisting the active cooperation of electrical contractors in industry-wide plans and projects.

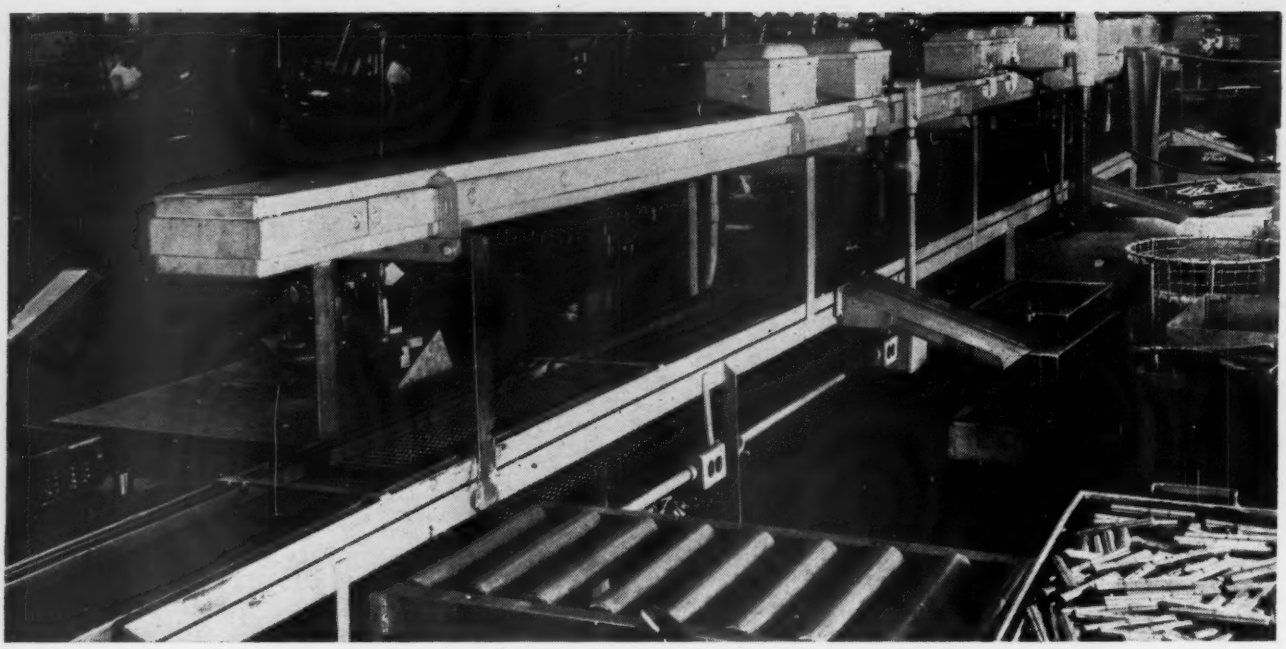
"In the difficult days of the depression, the personal respect and friendly confidence of his members were critical influ-

(Continued on page 146)

JAMES H. McGRAW AWARD CONTRACTOR MEDAL

Laurence W. Davis, NECA, receiving the James H. McGraw Award Contractors Medal from W. T. Stuart, secretary, Committee of Awards.

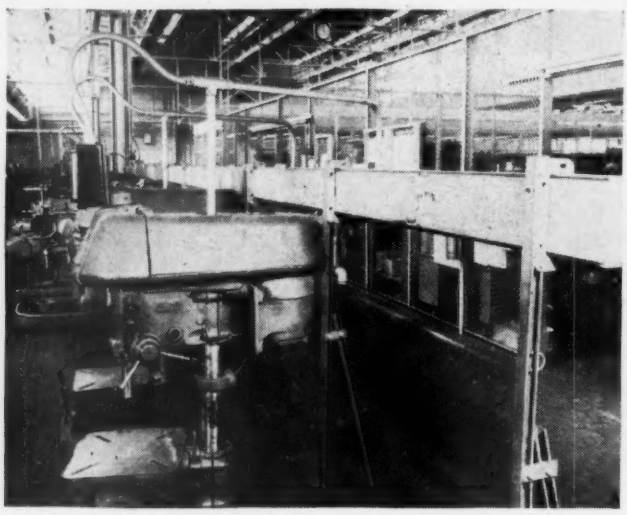
McGraw Award Medalists (back row) R. W. McChesney, 1941; L. W. Davis, 1948; George Andrae, 1946; L. E. Mayer, 1934; G. W. Patterson, 1937; (front row) J. W. Collins, 1947; C. L. Chamblin, 1925; Louis Kalischer, 1930; A. L. Bush, 1940.



LOW MOUNTING of 600-ampere duct over belt conveyor feeding pump shaft grinders. Unistrut cross-pieces, welded to flat steel uprights, support duct 15-inches above conveyor on 5-ft centers.

TAILORED DISTRIBUTION

Unique applications of bus duct to conveyorized production at New Departure's Sandusky, Ohio plant.



FLOOR MOUNTING of 225-ampere, 3-phase plug-in type bus duct behind a row of drill presses. Unistrut supports are 5 ft. 9 in. high; 6 ft. 6 in. on centers; can be easily dismantled.

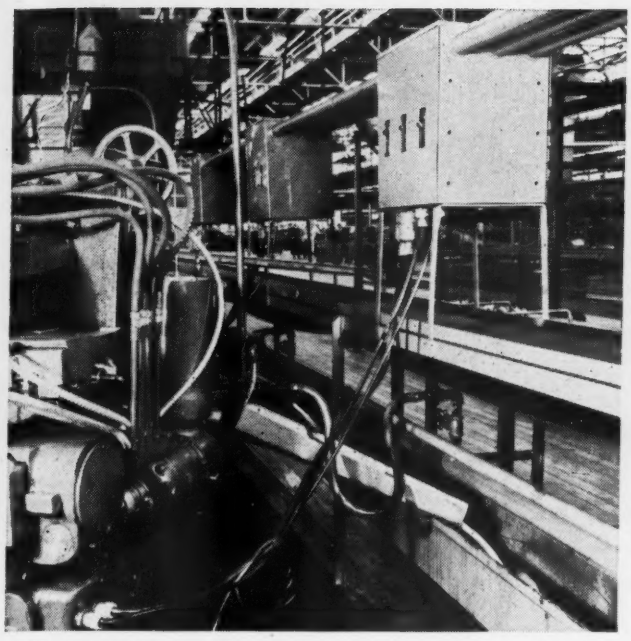
MODERN electrical distribution is keyed to the production requirements of individual plants. At the new Sandusky, Ohio, plant of the New Departure Division of General Motors Corporation, the electrical system design emphasizes capacity, flexibility, rearrangement and maintenance ease, and operating economy.

From an outdoor substation containing two $5,000 kva., 33.5/3.8 kv., 3-phase transformers, a 13.8 kv. underground, primary network (six feeders) serves seven load centers where 460-volt secondary power is obtained. Five of these substations, located in manufacturing areas, have two 1,000 kva. transformers each, with a tie breaker across their secondaries. The other two each have one 1,000 kva. transformer.

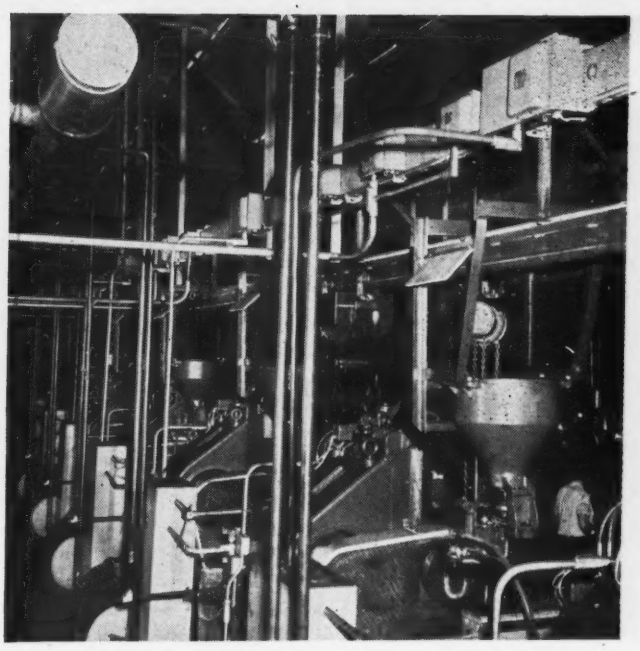
Main secondary distribution consists of runs of 600-ampere, 575-volt, 3-phase, plug-in, bus duct mounted on 50-ft. centers to the roof trusses. Duct lines are fed from secondary switchgear by 750MCM, 3-conductor armored cable.

To carry this system flexibility right down to the point of utilization, New Departure's Plant Engineering Department tailored their power sub-feeder design to fit their specific distribution problem—serving numerous machines along conveyorized production lines. *Their unique approach was to use the conveyor frame to support the duct runs.* In many cases this brought the plug-in disconnects within easy reach from the floor. In general, all power branches are within easy step-ladder reach, an important factor when production line and machine location shifts are contemplated.

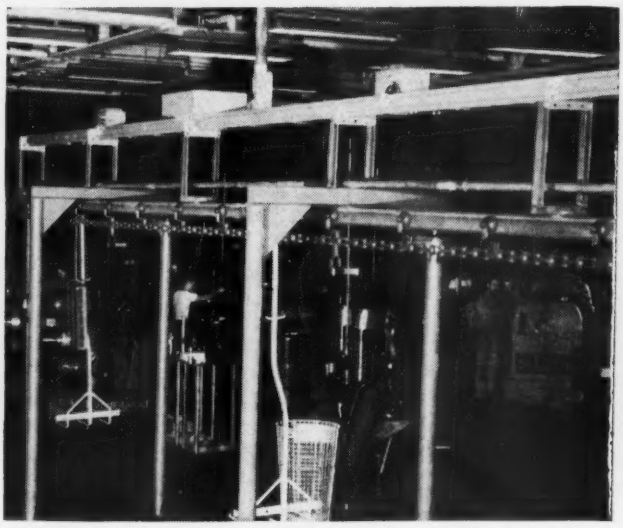
This technique shortened conduit branch circuits to individual machines; eliminated the "forest" of conduit and cable drops inherent with



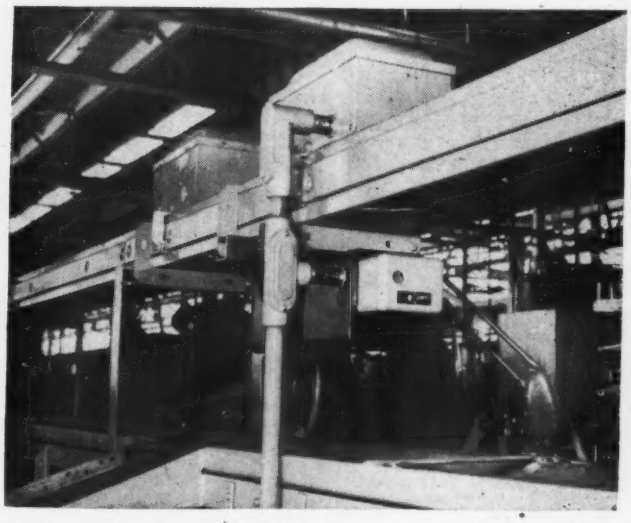
MULTI-CYCLE service to high speed precision grinders. Conduits contain standard, hi-cycle and d-c circuits.



BRACKETS ON MONORAIL carry duct along line of ball grinders. Unistrut supports facilitate duct installation.



DUCT ON CONVEYOR. Unistrut brackets welded to monorail chain conveyor members at 7 ft. 6 in. centers support plug-in duct 10-ft. above floor.



LIGHTING TRANSFORMER on conveyor duct provides 110-volts for inspection bench lights and convenience outlets. A 15-ampere breaker protects secondary of 1 kva. unit.

truss-mounted duct; took full advantage of a well designed general lighting system.

Installation ease, as well as revamping flexibility and salvability were effected by mounting the duct to Unistrut supports of both floor (5-ft, 9-in. high in machine shop) and conveyor-bracket types. Bracket drilling was unnecessary.

Still another advantage to this duct distribution system is the low voltage drop between substations and points of ultimate utilization; an efficiency value with an economic return.

Multi-cycle distribution for high speed, precision grinding machines is also mounted to a conveyor frame. Conduit circuits feed take-off enclosures at machine locations. Each box contains circuit breakers and receptacles (flexible cord and plug machine connections) for standard, high-cycle and direct current circuits.

Contributing to system operating economics is the generous use of capacitors for power factor correction. Sixty percent of the units are installed in banks of 90 kva. on the overhead bus ducts; 10 percent are installed in banks of 15 kva. on the load side of the larger induction motor starters (go on and off with the load); the remainder are added in banks of 270 kva. at the substations.

Emergency power for essential equipment and lighting is provided by a 200 kw. 460-volt, 3-phase turbo-generator. Direct current for crane operation comes from a 100 kw. Ignitron rectifier.

Collaborators in this modern electrical system design were New Departure's Plant Engineering Department and the electrical engineering department of Albert Kahn Associated Architects and Engineers, Inc., plant designers.

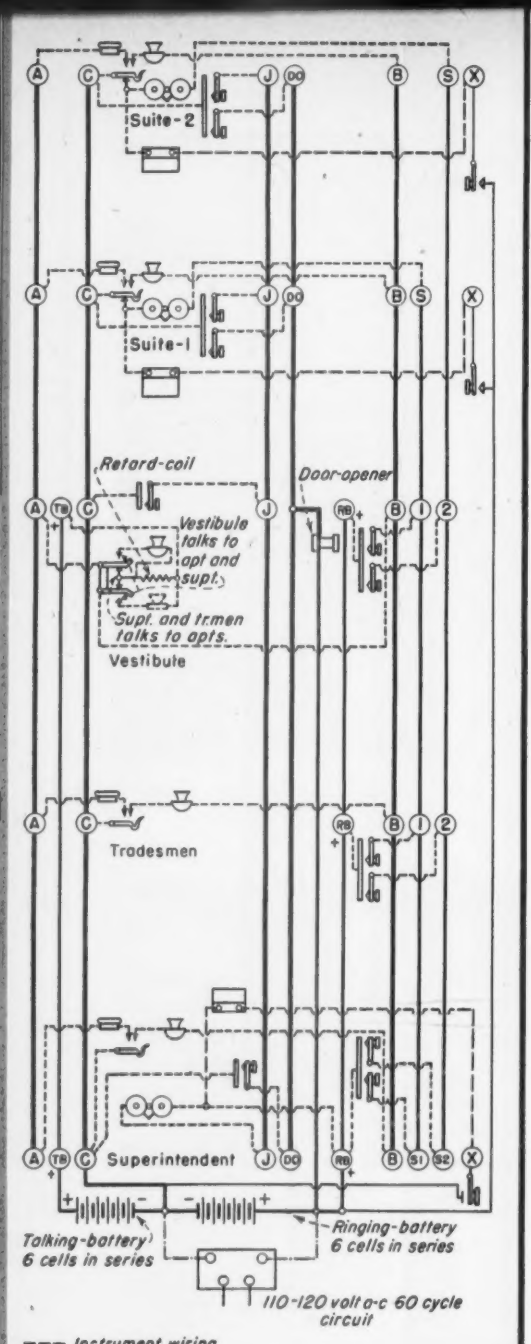


FIG. 1—Wiring diagram for apartment house telephone system with loud-speaking vestibule unit.

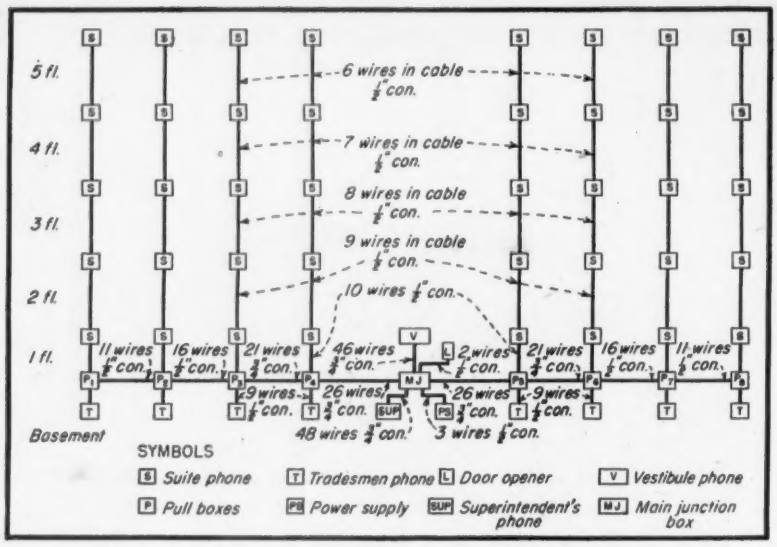


FIG. 2—Layout for apartment house telephone system.

Intercommunicating TELEPHONE LAYOUT

By A. A. Schuhler

THE planning, designing and the layout of an intercommunicating telephone system, whether it is to be used in an apartment house, business office or industrial plant, is in many respects similar to the procedure followed in other forms of wiring such as in lighting.

The method used in the wiring of such a system is determined by conditions. For existing residences, exposed work, individual conductors or cables may be enclosed in raceways, or cable may be fastened by means of straps. For existing residences, concealed work, cables may be fished through walls and ceilings. For new residences, concealed work, the cables may be installed in the walls and ceilings, preferably in rigid conduit. For business and other buildings of frame or of brick and frame construction use same methods as for residences. For fire-resistant and fire-proof buildings use cables in rigid conduit.

In laying out an installation, the specifications should be checked to determine the type of system, equipment and construction required. A wiring diagram of the system should be obtained from the manufacturer of the equipment and thoroughly studied. A plan should then be made showing the location of all telephones, riser or floor junction or pull boxes, main junction box, power supply and the number of wires required between these points. For rigid conduit construction, the sizes of all conduits should be shown thereon. A separate chart should be made to show the size of each junction or pull box and the number of terminal strips and their respective connectors. Another chart should be made to show wire connections to their respective connectors. Consideration must also be given to include spare conductors and terminal connectors.

A typical layout of an apartment house telephone system in accordance with the wiring diagram shown in Fig. 1 is given herewith. The system functions as follows: Only one conversation is possible at one time. Each suite telephone has two pushbuttons, one to operate the door opener, and one to call the superintendent. Each tradesman's telephone has five pushbuttons each used for calling an individual suite in its respective dumbwaiter riser. The superintendent's telephone has 41 pushbuttons, of these 40 are used to call the respective suites, and one is used to operate the door opener. The loudspeaking vestibule telephone has 41 pushbuttons, of these 40 are used to call the respective suites and one is used to call the superintendent.

Where the system is to be installed in conduit, prepare a chart or riser

RISER JUNCTION BOX CHART

Post No.	Phone Term.	Cable From Suites	Cable From Tradesman	Cable From P1 to P2
1	C	Red No. 18	Red No. 18	Red No. 18
2	J	Mate "	——	Mate "
3	DO	Black "	——	Black "
4	RB+	——	Mate "	Mate "
5	A	Blue No. 22	Blue No. 22	Blue No. 22
6	B	Mate "	Mate "	Mate "
7	S 1	Orange "	Orange "	Orange "
8	S 2	Mate "	Mate "	Mate "
9	S 3	Green "	Green "	Green "
10	S 4	Mate "	Mate "	Mate "
11	S 5	Brown "	Brown "	Brown "

FIG. 3—Connection chart for telephone riser.

Phones for interior communication are essential features of many building and remodeling projects. Current practice and methods are discussed.

diagram similar to that shown in Fig. 2, showing the relative location of all telephones, junction or pull boxes, power supply, the number of wires between all points and the sizes of all conduit runs. The location of the telephones is shown on the electrical plans. In apartments these locations are usually typical throughout. The location of the junction or pull boxes is usually selected by the contractor and are usually placed at the bottom of the risers, either in the upper part of the wall or in the ceiling. The main junction box should be located approximately in the center of the distribution system, in the wall or ceiling. The power supply unit should be located and mounted on the wall near the main junction box, being fed from the nearest house lighting distribution center.

The riser diagram shows a total of eight riser junction or pull boxes and one main junction box for the vestibule and superintendent's telephones respectively. Terminal strips should be installed in all of these cabinets. Standard sizes should be selected and these may be had in 7, 11, 16, 21, 26

MAIN JUNCTION BOX CHART

Post No.	Phone Term.	Cable From P1 to P4	Cable From P5 to P8	Cable From Supt.	Cable From Vestibule	Wire From Bat.* & DO
1	C	Red No. 18	Red No. 18	——	——	——
2	C	——	——	Red No. 18	Red No. 18	Red No. 18*
3	J	Mate "	Mate "	——	——	——
4	J	——	——	Mate "	Mate "	——
5	DO	Black "	Black "	——	——	——
6	DO	——	——	Black "	——	Black "
7	RB+	Mate "	Mate "	——	——	——
8	RB+	——	——	Mate "	Mate "	Red-Blue"
9	A	Blue No. 22	Blue No. 22	——	——	——
10	A	——	——	Blue No. 22	Blue No. 22	——
11	B	Mate "	Mate "	——	——	——
12	B	——	——	Mate "	Mate "	——
13	TBQ	——	——	Orange-White"	Orange-White"	Yellow "
14	S 1	Orange "	——	Orange "	Orange "	——
15	S 2	Mate "	——	Mate "	Mate "	——
16	S 3	Green "	——	Green "	Green "	——
17	S 4	Mate "	——	Mate "	Mate "	——
18	S 5	Brown "	——	Brown "	Brown "	——
19	S 6	Mate "	——	Mate "	Mate "	——
20	S 7	Slate "	——	Slate "	Slate "	——
21	S 8	Mate "	——	Mate "	Mate "	——
22	S 9	Blue-White"	——	Blue-White"	Blue-White"	——
23	S 10	Mate "	——	Mate "	Mate "	——
24	S 11	Blue-Orange"	——	Blue-Orange	Blue-Orange"	——
25	S 12	Mate "	——	Mate "	Mate "	——
26	S 13	Blue-Green"	——	Blue-Green"	Blue-Green"	——
27	S 14	Mate "	——	Mate "	Mate "	——
28	S 15	Blye-Brown"	——	Blue-Brown"	Blue-Brown"	——
29	S 16	Mate "	——	Mate "	Mate "	——
30	S 17	Blue-Slate"	——	Blue-Slate"	Blue-Slate"	——
31	S 18	Mate "	——	Mate "	Mate "	——
32	S 19	Orange-White"	——	Orange-White"	Orange-White"	——
33	S 20	Mate "	——	Mate "	Mate "	——
34	S 21	——	Orange "	Orange-Green"	Orange-Green"	——
35	S 22	——	Mate "	Mate "	Mate "	——
36	S 23	——	Green "	Orange-Brown"	Orange-Brown"	——
37	S 24	——	Mate "	Mate "	Mate "	——
38	S 25	——	Brown "	Orange-Slate"	Orange-Slate"	——
39	S 26	——	Mate "	Mate "	Mate "	——
40	S 27	——	Slate "	Green-White"	Green-White"	——
41	S 28	——	Mate "	Mate "	Mate "	——
42	S 29	——	Blue-White"	Green-White"	Green-Brown"	——
43	S 30	——	Mate "	Mate "	Mate "	——
44	S 31	——	Blue-Orange"	Green-Slate"	Green-Slate"	——
45	S 32	——	Mate "	Mate "	Mate "	——
46	S 33	——	Blue-Green "	Brown-White"	Brown-White"	——
47	S 34	——	Mate "	Mate "	Mate "	——
48	S 36	——	Blue-Brown "	Brown-Slate "	Brown-Slate "	——
49	S 36	——	Mate "	Mate "	Mate "	——
50	S 37	——	Blue-Slate "	Slate-White "	Slate-White "	——
51	S 38	——	Mate "	Mate "	Mate "	——
52	S 39	——	Orange-White"	Blue "	Blue "	——
53	S 40	——	Mate "	Red Mate "	Red Mate "	——

FIG. 4—Connection chart for main junction cabinet.

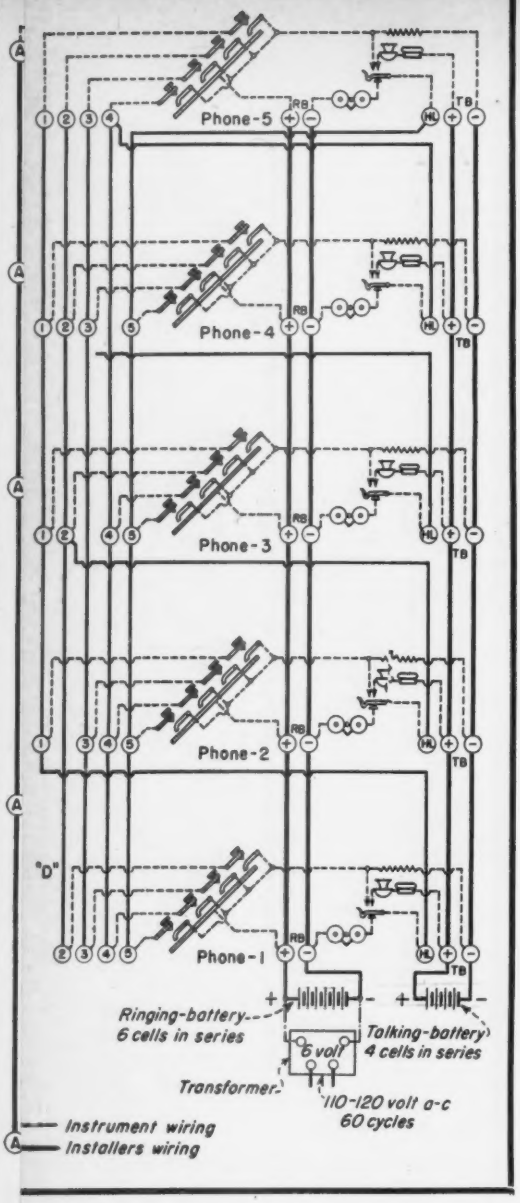


FIG. 5—Wiring diagram for office intercommunicating telephone system.

pair terminals having 14, 22, 32, 42, 52 individual terminals. The terminal strip in pull boxes P1 and P8 having eleven wires each should have seven pairs of terminals (1–7 pair strip), pull boxes P2 and P7 having 16 wires each should have eleven pair of terminals (1–11 pair strip), pull boxes P3 and P6 having 21 wires each should have eleven pair of terminals (1–11 pair strip), pull boxes P4 and P5 having 26 wires each should have 16 pair of terminals (1–16 pair strip), and the main junction box having 47 wires should have sufficient terminals for these plus six extra duplicated common, battery and door opener wires a total of 53 or 27 pair of terminals (1–11 & 1–16 pair strips). The duplicated terminals eliminates the necessity of having more than one wire under each washer on the terminal posts. The terminals indicated above for the riser junction or pull boxes allows for a few spares over and above those required for the conductors. The terminals indicated for the main junction box does not allow sufficient spare terminals. It is therefore suggested that 32 pairs of terminals (2–16 pair strips) be used.

In selecting the sizes of the junction or pull boxes, the number of conductors and the number of terminals must be considered. Check the measurements of the different sizes of terminal blocks and allow sufficient space all around the blocks for lacing and fanning the cable and the conductors. The blocks may be arranged in parallel with each other or in tandem. The former arrangement reduces the length of the cabinets while the latter arrangement reduces the width of the cabinets.

The number of wires between all points is shown in Fig. 2. This is based upon the wiring diagram in Fig. 1. The use of cable has been suggested, except for the door opener and power supply wires from the main junction cabinet. A cable installation is the most economical from the standpoint of handling and requires smaller conduit than loose individual wires. Occasionally single wires are used on the dumbwaiter risers. The cable suggested is of the braided type composed of two pairs No. 18 B & S gauge wires and the balance paired No. 22 B & S gauge wires. Cables incorporating single No. 22 wires may also be used. The heavier wires are used to carry the major common wires and the smaller wires are used as sections to the suites.

Color coded wires should be used in all telephone work, and the cable type of installation is ideal in this respect. Some of the color combinations vary with different manufacturers. It is suggested that a connection chart be made up showing the connection of each wire to the proper terminal. A copy should be fastened to the interior of each junction or pull box for maintenance purposes. Figs. 3 and 4 show connection charts for the riser and the main junction boxes.

The size of the conduit shown is based upon the recommendations of the wire manufacturers, the square inch area of the cable versus the dimension of the conduit for ease in installing, and per tables covering this subject in the January 1948 issue of this publication.

The power supply unit should be sufficiently large to provide sufficient current and voltage for the talking and ringing requirements. In this case since the vestibule telephone is of the loudspeaking type nine volts direct current is necessary for talking. The ringing current is provided by 6–12–18 alternating current taps.

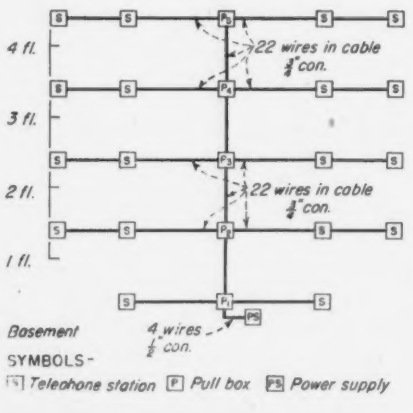


FIG. 6—Layout for office intercommunicating telephone system.

Typical Layout

A typical layout of a telephone system for an office or general business establishment in accordance with the wiring diagram shown in Fig. 5 is described hereafter. The system functions as follows: This is a selective-talking, selective ringing system in which any telephone can call any other telephone without interference, providing no other telephone calls either one of the telephones that are in use at that particular time. Each instrument has a sufficient number of pushbuttons to call all others in the system. In this case there are a total of 18 telephones and each has 20 pushbuttons 17 of which are used to call any of the other stations, the remaining buttons are spare and may be used for expansion.

In a conduit installation a chart or riser diagram may be drawn as shown in Fig. 6, showing the location of all telephones, junction and pull boxes, power supply, and the number of wires in each run of conduit. In offices and business establishments in general, the location of the instruments are not always typical from one floor to another, therefore, the locations of the junction and pull boxes may vary slightly. Usually these boxes are placed at a central point on each floor and are installed in the wall of a closet or wire space.

The riser diagram shows a total of five junction or pull boxes, one for

[Continued on page 152]

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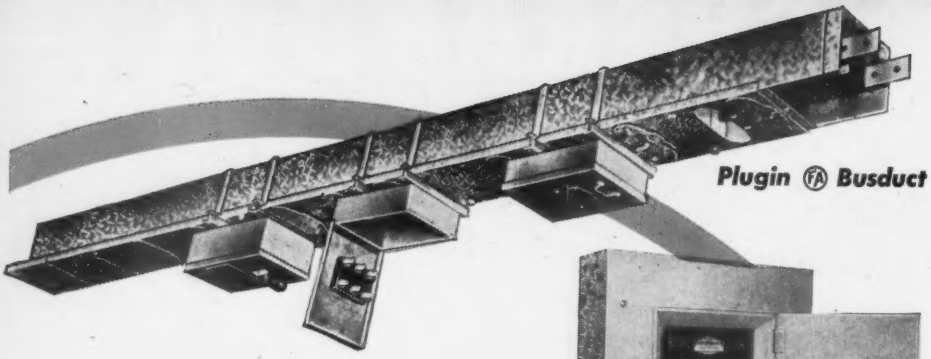

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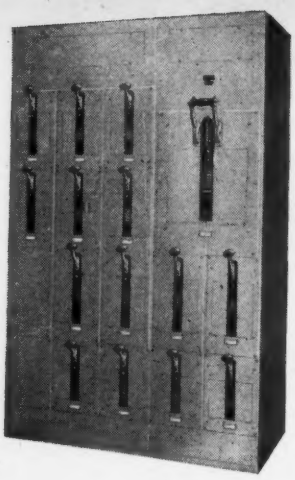
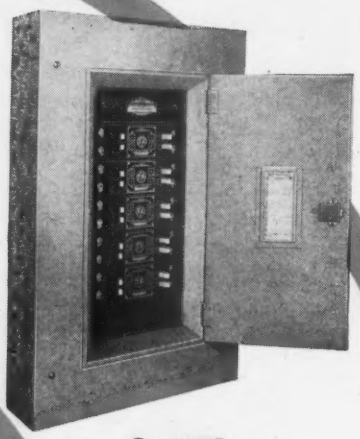


Ⓕ Shutlbrak



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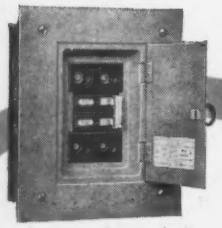

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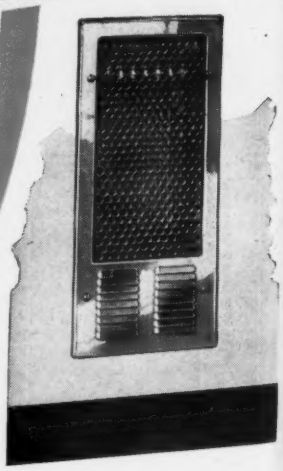
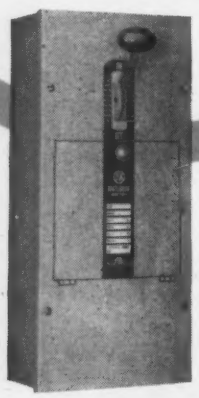
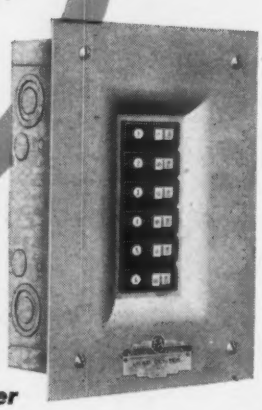


Ⓕ Shutlbrak Switch





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Practical Methods

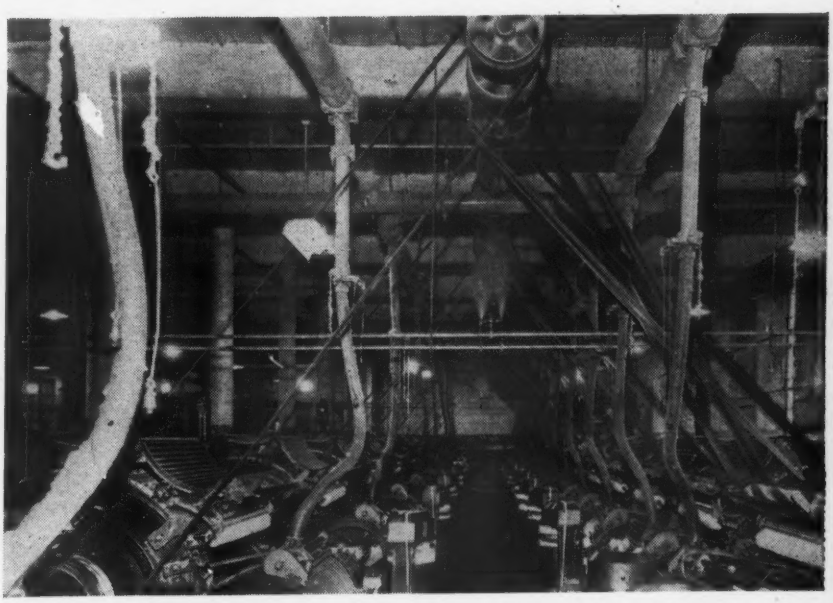
Individual Motors Reduce Shutdowns

INDUSTRIAL

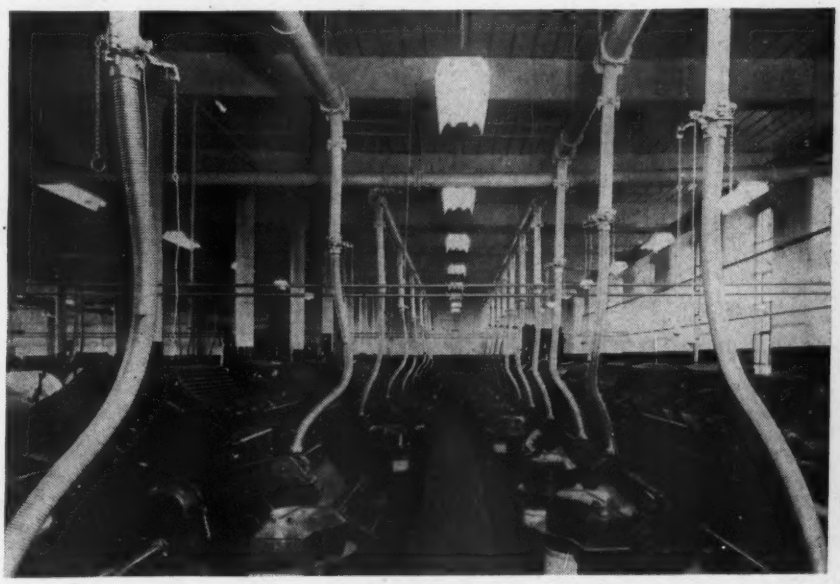
Conversion of the Exposition Cotton Mills, Atlanta, Georgia, from a group-driven card machine system to a series of individual driving motors, has eliminated shaft maintenance, belt replacement and total shutdowns which were formerly prevalent due to motor failures on mainline shafts. Prior to the inauguration of this conversion program, 249 flat-top card machines were group-driven by seven induction motors, including one 20-hp., one 25-hp., one 40-hp., one 50-hp. and three 75-hp. units. Line-shaft trouble was frequent, due to hot bearings. It was necessary to frequently check the level of shafts and lubricate all pulleys. And, since each card machine required 30 feet of 3-inch light double-lap belt, the cost of transmission was excessive. With many card machines depending on each large drive motor, a single motor failure resulted in a shutdown of all machines on that shaft.

During the first year of conversion, over half of the card machines were equipped with 1½-hp. totally enclosed, waste-packed-bearing, textile mill motors, with flexible, positive connections between motors and drums established through encased silent chain drives. Each motor is controlled by a pushbutton starting switch, on the base.

In discussing the conversion program, J. C. Edwards, Superintendent of the Exposition Mills, claims that the cost of the conversion program will be liquidated in from 10 to 12 years through the savings in shaft maintenance and belt replacements alone. Maintenance has been drastically reduced and card machines now operate at uniform speeds; a condition which was practically impossible when machines were driven by line-shaft group drives. Another interesting feature of the individual motor installation is the elimination of static which formerly produced product waste. No longer are belts a safety hazard to personnel in the plant, dirt is no longer thrown onto the cotton stock and greater flexibility can be exercised.



Corner card room at the Exposition Cotton Mills, Atlanta, Georgia, when operating on a line-shaft group-driven plan, was crowded, dirty and hazardous. Moving belts and shafts created product waste through static, deposited dirt on cotton stock, and introduced industrial dangers to operators.



Conversion program involved installation of 1½-hp. totally enclosed textile mill motors on individual machines with power transmitted from motor to card machine through encased and silent chain drives. Uniform speeds, reduced maintenance and curtailed operational costs have resulted.

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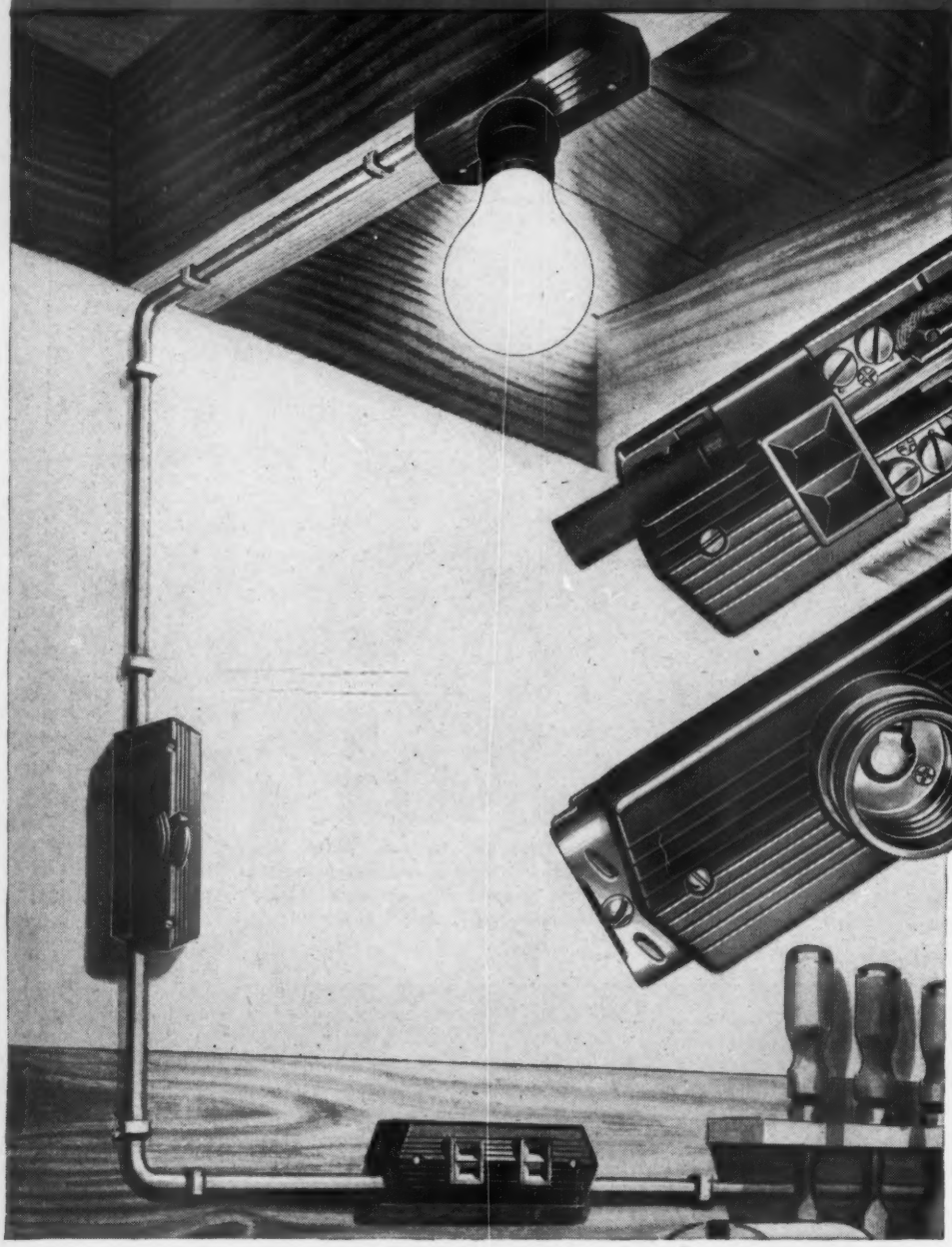

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2690-6 BX Cable Clamp

Now you can run approved, permanent surface wiring *faster* . . . and save time and money on wiring jobs.

How's it done? Use Monowatt "All-In-One" Surface wiring Units. They cost less, for one thing. And just seven units do the whole job whether you're wiring with building wire, non-metallic cable or BX . . . no need for dozens of separate boxes, devices, covers and fittings. Wiring's simpler, too. You use less cable and speed installation. Feed through bus in each device means no splicing, no taping, no soldering. Result: lower wiring costs, higher profits.

Made of plastic, Monowatt Surface Wiring Units are light, tough and durable. Moisture or other corrosive elements in the air (in barns, for example) will not affect them. Widely used in Quonset huts during the war, these units worked in the dank "impossible" climate of the jungle, and in the 50° below "weather" of the frozen North. Here, then, is no make-shift "temporary" wiring device, but an improved and *job-proved* method of permanent wiring!

Save wiring time, cut installation costs-boost your profits on wiring jobs!

OPENS UP NEW, BIG OPPORTUNITIES

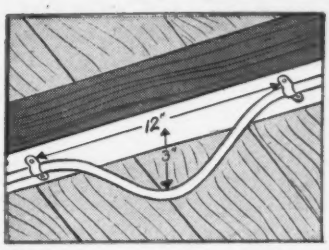
ON THE FARM. Farm buildings are being electrified more than ever before. You can get a bigger share of these new farm wiring jobs if you use lower-cost, faster-to-install Monowatt surface wiring units. Low cost and long-lasting, they're just the thing for farm wiring.

IN THE CITY. Take advantage of the growing need for approved, low-cost wiring. Use Monowatt surface wiring units for wiring garages, basements, attics, utility spaces . . . anywhere you now wire with conventional surface wiring you can cut costs by switching to Monowatt.

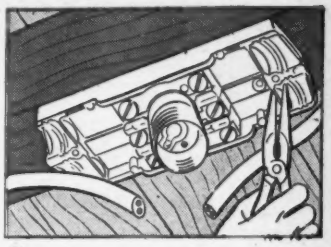
TYPICAL OF THE MONOWATT LINE

These surface wiring units typify the line of Monowatt construction devices. With Monowatt materials you wire faster, and at lower cost. Ask your Graybar salesman to show you the complete, money-making Monowatt line. You'll be interested in the many cost saving features.

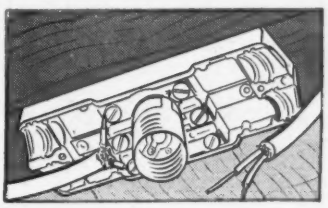
SAVE WORK HOURS



1. *Run cable, leaving a loop for each device you plan to install.*

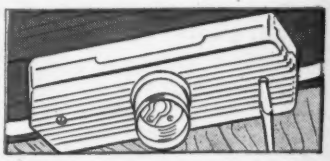


2. *Cut each loop. Screw down device. Break out knockouts for cable.*



3. *Strip and attach wires. No splicing necessary.*

For BX, separate metal clamp secures cable and acts as continuing ground.



4. *Screw down cover. Non-metallic cable (or building wire) is clamped firmly in place without need for special connectors. Ask your Graybar salesman to demonstrate to you this exclusive Monowatt feature.*

GRAYBAR QUALITY SINCE 1869 REG U.S. PAT. OFF.

Distributed by GRAYBAR ELECTRIC COMPANY

STOCKS IN MORE THAN 100 PRINCIPAL CITIES

MONOWATT INCORPORATED

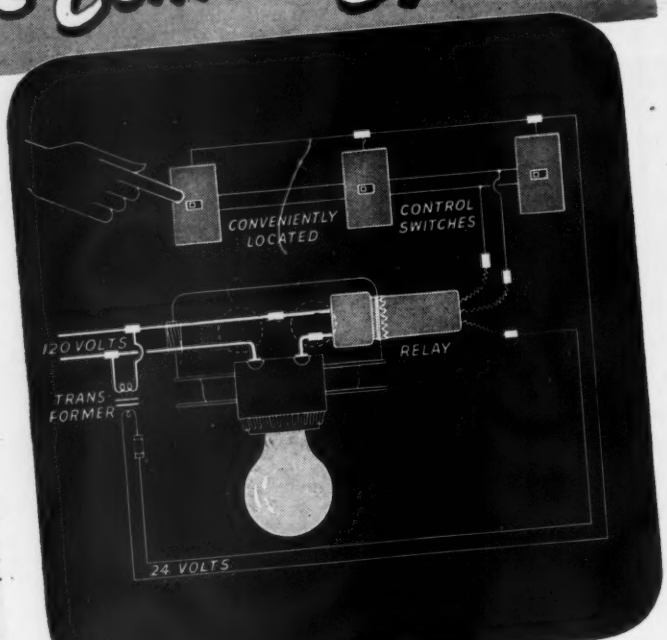
A General Electric Affiliate

PROVIDENCE, R. I.

Light the path ahead

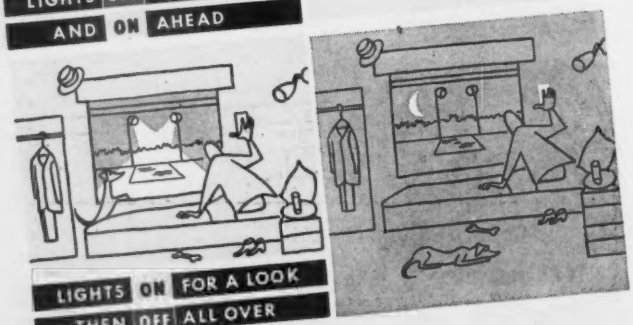
WITH SQUARE D's NEW Low Voltage Control System

use this
Remote Control Relay System
instead of conventional switching
for greater
CONVENIENCE · SAFETY · COMFORT
. . . at very reasonable cost



LIGHTS OFF IN GARAGE
AND ON IN KITCHEN

LIGHTS OFF BEHIND
AND ON AHEAD



LIGHTS ON FOR A LOOK
THEN OFF ALL OVER

• The above sketch shows how remote control relays are installed in knockouts of outlet boxes. The relays are controlled from any number of conveniently located switches operating on a 24 volt system. Only the load circuit wiring is at 120 volts.

One relay can be operated by several control switches, or several relays can be operated from one or more locations, using master switches.

Write **for Bulletin No. 1008, which gives details of this simple, low-cost way to adequate switching.**

Square D Company,
6060 Rivard Street, Detroit 11, Michigan

SQUARE D COMPANY

DETROIT · MILWAUKEE · LOS ANGELES

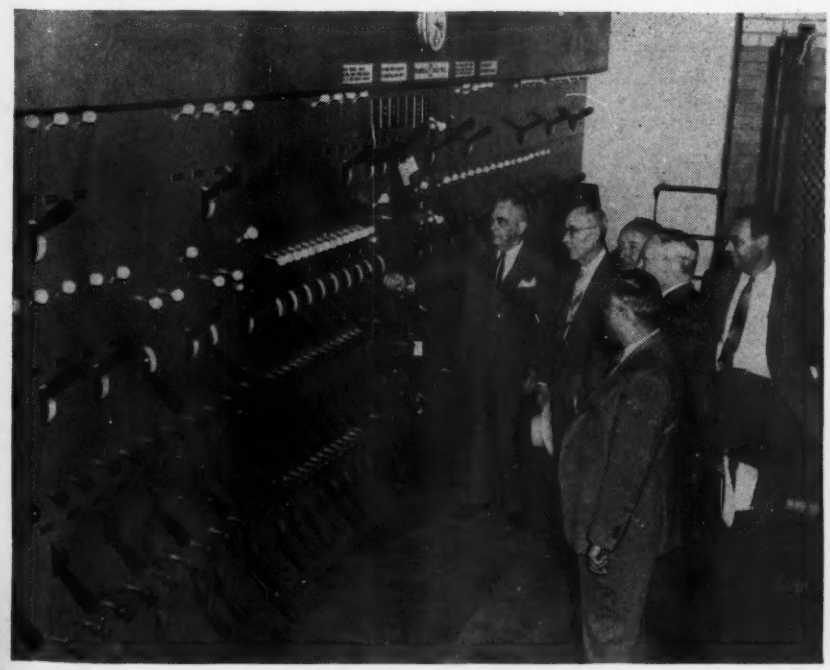
SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S. A., MEXICO CITY, D. F.

Oil Hydraulic Controlled Switchboard Installed

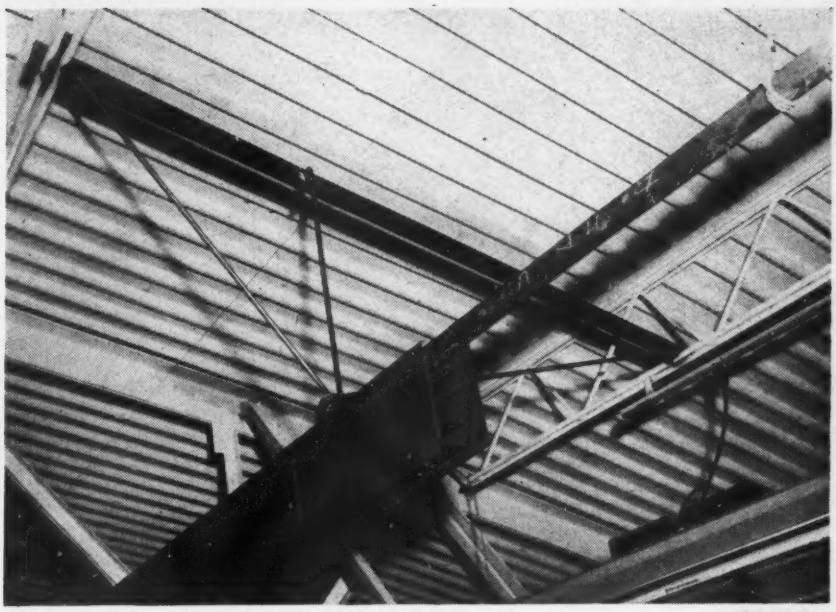
CONTROL

Convention Hall, Philadelphia, the nomination site for both Republican and Democratic presidential candidates, depended on the largest oil hydraulic-controlled stage switchboard in the world for regulation of the 1½-million watts of light installed in this Municipal Auditorium. Manufactured by the Trumbull Electric Manufacturing Company, Plainville, Connecticut, in a 16-weeks period to meet political convention requirements, the main switchboard and auxiliary controls gross more than 14 tons. The main switchboard, weighing 19,000 pounds and extending 23 feet 8 inches overall, controls a million watts of light in three colors by means of 125 radial autrastats of 8,000 watts capacity each. An additional half-million watts of lighting is controlled by direct switching. Both color and intensity of lights are controlled through an ingenious oil hydraulic cross control mechanism, permitting colors to be increased or decreased in intensity, either individually or collectively, at any location and in any possible combination. The board was engineered and designed by J. G. Geremia of the Trumbull Company.

Lighting was of such intensity that television and movies could be made without additional illumination.



Largest oil hydraulic-controlled stage switchboard in the world is installed in Philadelphia's Municipal Auditorium for national political conventions. On hand when the main switchboard was placed in operation were (clockwise, front row) Mayor Samuels of Philadelphia, Councilman O'Halloran, Director of Public Safety Malone, Electrical Bureau Chief Simons, Convention Hall Superintendent Panetta and (right rear) J. G. Geremia of the Trumbull Electric Company.



Typical anti-sway suspension designed by the Gustav Hirsch Organization, Inc., for the bus duct installation they made at the Kingston-Conley Co., Division of the Hoover Co., plant at Cambridge, Ohio. Note angle-iron template on duct awaiting delivery of a T-tap.

Anti-Sway Braces Support Bus Duct

WIRING

Distribution for power and lighting at the new Kingston-Conley Electric Company, Division of the Hoover Company, plant at Cambridge, Ohio, is provided by four 570-ft. runs of 400-amp., 250-volt, 3-phase, 4-wire bus duct. Designed by architect Fred D. Jacobs, Coshocton, Ohio, the system was installed by the Gustav Hirsch Organization, Inc., Columbus electrical engineering and contracting firm.

All of the duct is mounted above the bottom chords of the roof trusses to provide full clearance for electric motor manufacturing equipment installed throughout the area. Hook rods with a long thread and double adjusting nuts on one end provided normal suspension facilities. These were

Longer rods were needed to suspend duct line near center of roof section.

GEDNEY FITTINGS

GROUND FITTING TYPE G-571

INSULET TYPE 1640

GROUND FITTING TYPE G-572

GROUND FITTING TYPE G-80

CLAMP BACK TYPE 141

PIPE STRAP TYPE 14-50

EMT BACK TYPE 151

EMT STRAP TYPE 15-50

BONDING BUSHING TYPE 261

GROUND FITTING TYPE G-50

GEDNEY FITTINGS . . . FIT IN MORE WAYS THAN ONE

Made of TOUGH ENDURING MALLEABLE IRON

GEDNEY ELECTRIC CO.

GENERAL OFFICES: RKO BLDG., RADIO CITY, NEW YORK 20, N. Y.
FOUNDRY, FACTORY AND SHIPPING POINT: TERRYVILLE, CONN.

A COMPLETE LINE OF FITTINGS FOR RIGID CONDUIT, EMT ARMORED CABLE AND NON-METALLIC CABLE

Typical hook rod assembly fabricated in quantity to support bus duct runs. Here, rod is attached to standard duct clamp. Leveling nuts at clamp are for vertical duct alignment.

mounted to standard clamps which were attached to the top of the duct by inserting in the mounting channel and giving a quarter-turn twist.

After the duct was hoisted into position in the trusses, these rods were hooked over angle-iron cross-members which spanned and were welded to adjacent steel bar joists. Following alignment of the duct line (horizontal and vertical), the hook supports were welded to the cross-members. Steel tie-rods were then welded to the duct clamp and each end of the supporting cross-member at specific locations to provide a rigid anti-sway suspension.

Suspension hooks with duct clamps and tie rods were prefabricated at the job. Actual lengths varied with the section of the slanting roof under which the duct line was installed.

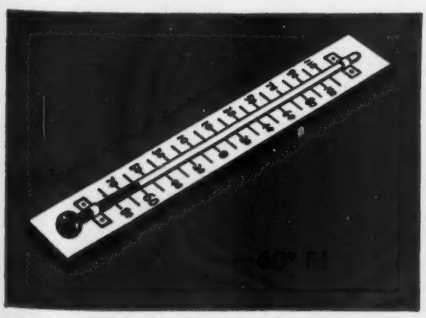
Simple Clamp for Mounting to Beams

WIRING

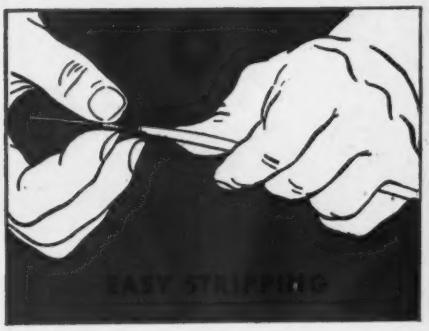
Electrical contractors frequently encounter job conditions where the owner or structural engineer will not permit punching or drilling of steel to mount electrical circuits or equipment. Two alternatives remain: Use of gun-welded studs for supports; or use of beam clamps. The former is a permanent technique and involves special equipment. The latter method can be used anywhere with only a wrench and screw driver, and can be taken down and reused if necessary.

Building vibration is one factor that

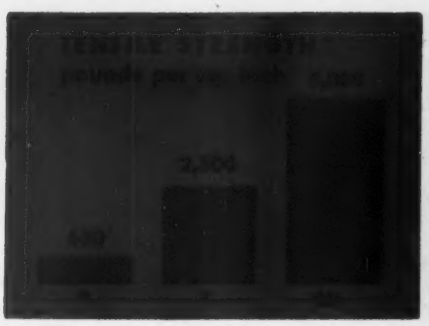
"Cold can't crack this wire ...It's Laytex RU"



"Even at temperatures of –60 degrees Fahrenheit, Laytex RU will not crack," says Mr. USRUBBY, the Wire Engineer. Nor will Laytex soften at high temperatures. Electricians find that Laytex RU permits more wires per conduit, because it is America's smallest diameter natural rubber covered building wire. Its conductors are perfectly centered in the insulation. There are no dangerous thin spots. Laytex RU is easily

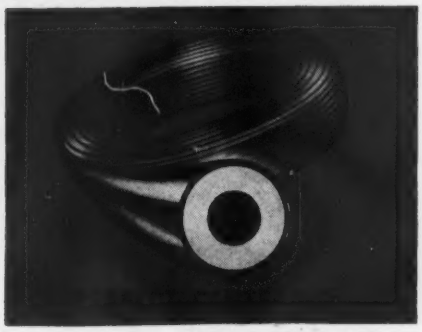


and quickly stripped. Moreover, the insulation can be rolled back to the braid—and back again over the barrel of the terminal. Laboratory tests prove that Laytex is tops in tensile strength. It will withstand an



unprecedented amount of stretch before breaking, and in all other physical and electrical qualities far exceeds other building wires. U. S. Laytex RU carries the label of the Underwriters' Laboratories and is listed in the National Electrical Code as an all-purpose wire. Send today for sample plus booklet containing more details about Laytex. Write Wire and Cable Department, United States Rubber Company, 1230 Avenue of the Americas, New York 20, N. Y.

*Reg. U. S. Pat. Off.



RU wiring with RU?

A PRODUCT OF

U.S. RUBBER
SERVING THROUGH SCIENCE

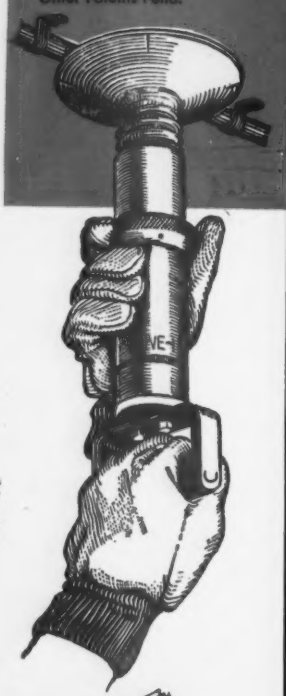
UNITED STATES RUBBER COMPANY

'49 Looks BRIGHT for ELECTRICAL CONTRACTORS...

...who use DRIVE-IT

U. S. Pat. No. 1984117
Other Patents Pend.

The Powder-Actuated Tool That Revolutionizes Installation!



DRIVE-IT has proved to be today's greatest time saver in installation, construction and maintenance. Hundreds of America's leading electrical and heating contractors have made sensational records of cost reduction with this revolutionary new tool. DRIVE-IT actually fires studs into concrete, masonry or steel. It eliminates drilling, hammering and the use of expansion bolts. It is adapted for hundreds of jobs such as fastening ventilators, cables, pipe, conduit boxes, metal lath and other materials to concrete walls.

Designed for SAFETY Plus *SPEED*

DRIVE-IT carries its own power — a powder cartridge which has terrific driving action — yet it is engineered for absolute safety. It is equipped with a bell mouth safety shield and a Universal Safety Guard. A patented safety ring prevents accidental firing even when dropped from a great height. Its recoil springs aborb all shock load.

40 Different Studs

Rivets, bushings and punches for every type of fastening job.

Write Today!
— for free illustrated bulletin on DRIVE-IT operation.

POWDER POWER TOOL CORPORATION
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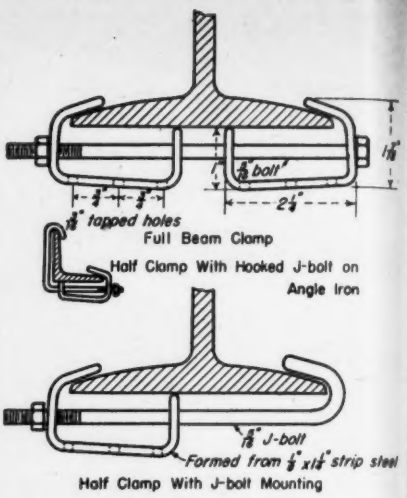
PORTLAND 1, OREGON



Sketch of heavy-duty beam clamp showing application of full or half clamp to a typical beam section.

must be considered when using beam clamps. Owners want assurance that electrical circuits and equipment will stay put under such conditions. That was the situation encountered by an enterprising Chicago electrical contractor when he installed the electrical system in one of the country's largest coal washer buildings near Pittsburgh.

To meet the owner's requirements, he designed a heavy duty clamp that grips the entire beam flange and is held rigidly in position by a $\frac{3}{8}$-in bolt. The clamp has three parts: Two gripping sections made from $\frac{1}{4}$-in. by $1\frac{1}{4}$-in. strip steel (bent as shown in the sketch below) and the assembly bolt. Each section is approximately $2\frac{1}{4}$ inches long, $1\frac{7}{16}$ inches high on the flange end and one inch high on the inside end. Three $\frac{3}{16}$-inch holes are drilled and tapped on $\frac{3}{4}$-inch centers in the bottom of each section. These will accommodate bolts for either a one-hole pipe strap, single conduit hanger, or an outlet box. Clamping sections and bolt are cadmium plated.

The clamp illustrated can be used on beams with a $4\frac{1}{2}$-inch to 5-inch flange. On beams with larger flanges, longer assembly bolts are used. Should only one-half of the clamp be required for mounting purposes, one section can be omitted and a J-bolt used as illustrated. In either case, after the nut is securely tightened, a locknut or washer can be used or the bolt threads can be hammered or burred a bit and the assembly will not loosen up due to building vibration. With the take-up nut on the side of the clamp, the mechanic has ample room to apply ample leverage to his wrench.

In addition to being sturdy, this beam clamp is a quick labor device; is easy to fabricate; and costs approximately 30 percent less than standard clamps now on the market. Simplet Electric Co., Chicago, is now producing these clamps.

SOUND CONSTRUCTION ASSURES

LONGER SERVICE LIFE

FROM TIREX PORTABLE CABLES

Simplex-TIREX Portable Electric Cables are carefully designed with an eye opened wide to the exacting and, very often, abusive conditions under which they must work. Toughness, flexibility, and safety are given top consideration and the result is a cable construction suited to day-in, day-out operation wherever the going is tough.

Check the advantages of this construction now. Keep them in mind. And next time you need cables for use on any portable electric equipment from hand tools to heavy shovels, remember to specify TIREX and profit by the dependable, low-cost cable service these features provide.

Conductors of TIREX Cables consist of small copper wires properly stranded together to provide non-kinking flexibility.

Conductor Insulation is a rubber compound having stable electrical properties and the mechanical strength necessary to withstand rough usage.

An **Inner Jacket** of durable rubber applied over the assembled insulated conductors forms the inner part of a tough protective covering for TIREX Cables. It provides a cushion for the conductors and protects them from mechanical shock whenever a cable is twisted or crushed.

Two **Seine Twine Serves,** hard-twisted for strength, are wound over the inner jacket to reinforce the protective covering and give it added wearability.

An **Outer Jacket** of Selenium Neoprene completes the construction. During vulcanization it is fused with the inner jacket and seine twine serves to produce a single, reinforced covering that is unexcelled for protection against abrasion, corrosive chemicals, weather hazards, sunlight, heat, and flame. It is not easily cut or worn and assures safe handling.

Simplex-Tirex

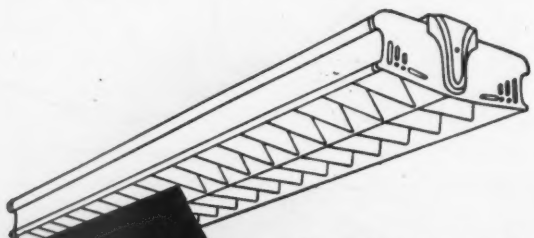
SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

Prosperous New Lighting Year, Partner!

You—the electrical contractor—are a key man in selling ***well-planned*** lighting to America. Our prosperity is inseparably linked to yours.

Here at Guth we're going to give you more cooperation than ever before. Some great new merchandising helps are being planned for you—watch for them!

Together we can make 1949 a bonanza in tapping the rich lighting market. Prosperous New Year, partner!



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Guth LIGHTING

THE EDWIN F. GUTH COMPANY, ST. LOUIS 3, MO.
Leaders in lighting since 1902

647

Moisture Drain For Metal Cable Troughs

WIRING

On a recent power house modernization and expansion project at Ohio State University, the Gustav Hirsch Organization, Inc., Columbus electrical contractors installed several hundred feet of heavy metal trough (open at the top) as a cable wireway in accordance with specifications of Sargent

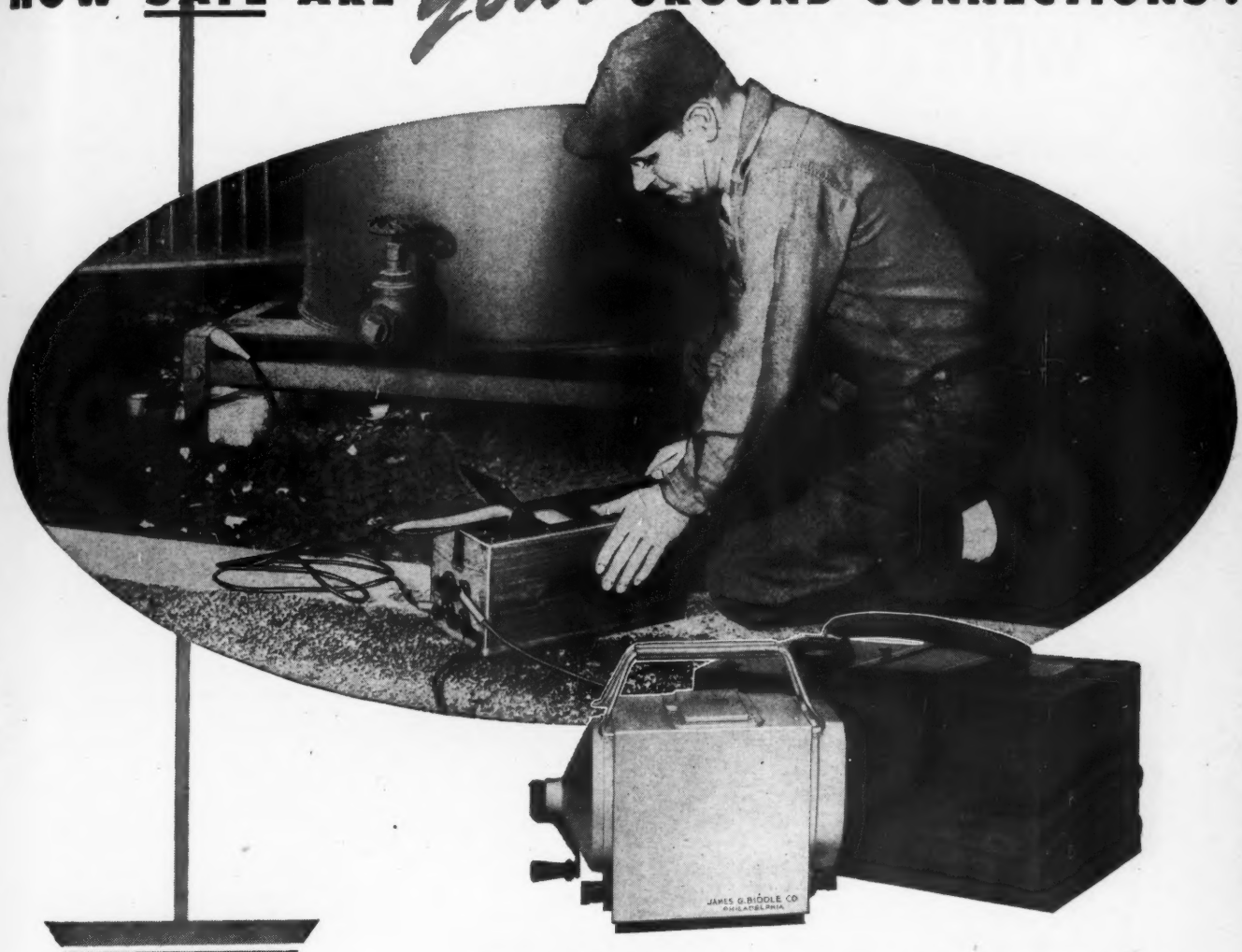
Typical screened opening for moisture drainage at low points in cable trough system at Ohio State University power house. Here trough fans out at cable rack over a switchboard.

& Lundy, Chicago consulting engineers. The trough wound under and over and around the maze of conduits and pipes that crowded the basement ceiling.

There is always a possibility of moisture and condensation pocketing at low points in the overhead trough. To avoid this, the specifications called for drainage openings at all low points in the run and wherever the trough fanned out at a switchboard or control cubicle. At such points, a rectangular opening (full width of trough) was cut in the bottom of the wireway and covered with a relatively fine mesh screening. Angle iron laterals, welded to each side of the opening, reinforce the trough and keep the screening in place.

Overtime on overtime causes furrowed brows of electrical contractors (L to R) George Volle, Springfield, Ill.; George Elmund, Elmhurst, Ill.; and L. W. Aldridge, Wm. N. Frye, Inc., Lake Forest, Ill., at Illinois Electrical Contractors conference in Peoria.

HOW SAFE ARE *Your* GROUND CONNECTIONS?



Ground connections that are improperly installed or have dried out; contacts that have become corroded and loose; exposed metal parts that may become "live" when they should be grounded—all of these can cause injury or death to personnel and material damage to operating equipment when lightning strikes or when faults occur.

Know the condition of all your man-made grounds through the periodic use of a "Megger"* Ground Tester. Available in two models, these well-known and widely-adopted instruments measure resistance to earth of ground connections, quickly, easily and accurately.

THE HEAVY DUTY "MEGGER" TYPE has great ruggedness and durability . . . built into a teakwood case. Has proportionately divided scales from 0 to 3 ohms (reading in .1 ohm) to as high as 0 to 30,000 ohms, with three, four or five ranges in the same instrument.

THE "MEG" TYPE is smaller and lighter, weighing only 8 pounds—mounted in a cast aluminum case. Scales are logarithmic in character, so as to cover as wide a range as possible within the limits of practical field accuracy. Ranges are single or double up to 3,000 ohms.

Send for Catalog 25-EC

Features of the "MEGGER" GROUND TESTER

- Has its own hand generator; requires no batteries or other external power supply
- Direct-reading in ohms—"like a voltmeter"
- No calculations, adjustments or "balancing"
- Only one set of connections
- Unaffected by the exact resistance of the reference grounds
- Unaffected by stray current in the earth either a-c or d-c, or by polarization or electrolysis
- Self-contained, rugged and portable
- Represents only a small fraction of the cost of adequate grounding protection

*REG. U. S. PAT. OFF.

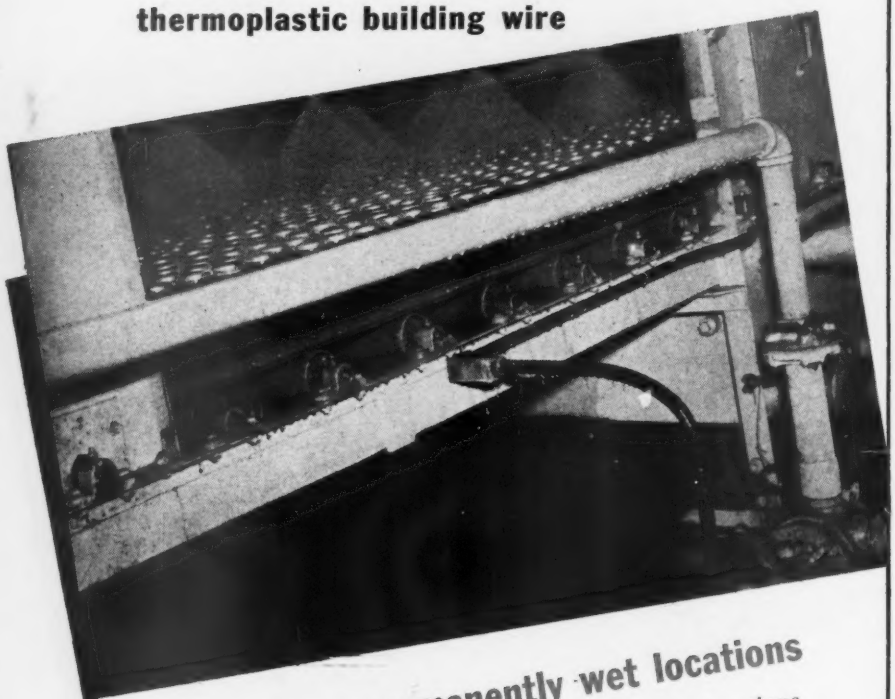
JAMES G. BIDDLE CO.

Electrical & Scientific Instruments

1316 ARCH STREET, PHILADELPHIA 7, PA.

WHAT IT MEANS TO WIRE WITH TYPE TW

GENERAL ELECTRIC TYPE TW
The first . . . and foremost thermoplastic building wire



for wiring permanently wet locations

When "specs" call for a wire to be used in wet locations where moisture is likely within the raceway—underground or in concrete slabs . . . in masonry in direct contact with the earth—*the* wire to use is General Electric Type TW. This top-quality wire is underwriter-approved in sizes No. 14 to No. 0000 Awg for use in raceways in these wet locations, and in sizes No. 14 Awg to No. 2000 MCM for open wiring.

In addition to the flame- and moisture-resistant qualities of General Electric Type TW, it is also resistant to oils, acids, and alkalies.

So for those tough wiring jobs remember General Electric Type TW. It's easy to strip, easy to pull, clean to work with.

Send for free booklet

The new free booklet, *Building Wires, Cables, and Cords for every purpose* gives more detailed information on Type TW and the rest of the General Electric line. For your free copy address Section W19-118, Construction Materials Department, General Electric Company, Bridgeport 2, Conn.

GENERAL ELECTRIC

AROUND THE CIRCUIT WITH YOUR G-E MERCHANDISE DISTRIBUTOR

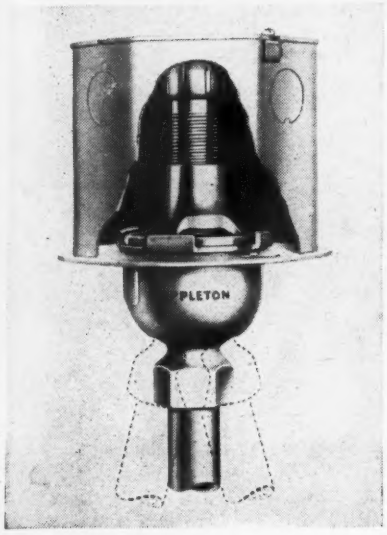
Was asked about BX the other day by a young fella just starting in the trade. I thought everybody knew all about **General Electric BX® armored cable:** that it was extremely flexible and easy to handle and that it goes in to last. When I checked my handbook, I found another feature I'd overlooked. In sizes 12 and 14, it's smaller and lighter in weight than ever before, with a special bonding strip to insure adequate ground.

Did you know that **service entrance cable** (Type SE—Style U) can be installed directly on the outside of a building without conduit? You can even paint the flame-retardant, moisture-resistant cotton braid if you want to. Another nice thing about this high-quality product is that, on short spans, you can run it from the pole right through to the meter equipment.

Had a call from Bill Brown for some information on the wiring of his new livestock barn. One of the requirements was that the cable had to withstand weather extremes, and fumes and corrosive vapors. I told him the General Electric people must have had him in mind when they designed **Super PVX® nonmetallic sheathed cable.** This top-quality cable is for those difficult jobs where easy installation and long service life under the worst conditions are important. Super PVX comes in ivory or brown color to give a trim, neat appearance on surface wiring jobs. Stop by for a sample.

WIRES AND CABLES

Equipment News



Swivel Hanger

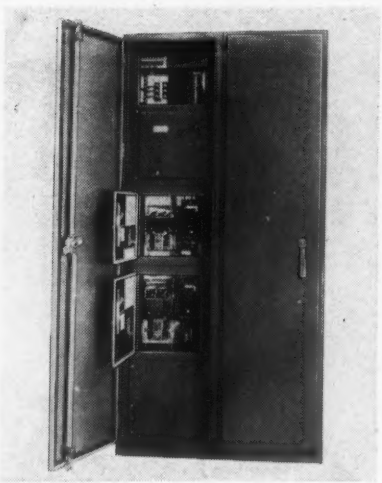
Announcement has been made of a new Type "SSH" safety swivel hanger, which is furnished complete with cover and for use with 1½ inch to 4 inch deep concrete boxes. Also 4 inch octagonal boxes measuring 1½ inches or 2⅛ inches deep. Weight of entire suspended unit is borne by a fixture stud. Hanger is furnished complete with a steel plate to serve as a cover for either the 4 inch octagonal boxes or concrete rings. Hanger is supplied with either ½ or ¾ inch hub for pendant fixtures. One style is supplied without extension piece and is recommended for use on 1½ inch deep or 2⅛ inch deep 4 inch octagonal outlet boxes. Appleton Electric Company, 1701-59 Wellington Avenue, Chicago 13, Ill.

Wire

RoLene weatherproof, a polyethylene covered wire, has been added to this line of wires and cable. It offers advantages of moisture resistance, long life with no braids to festoon or rot, lighter weight and smaller diameter, plus resistance to abrasion, sunlight and other weather hazards. It is available in sizes from No. 12 through No. 4 AWG with solid bare copper conductors, and in size No. 2 and No. 1 AWG with concentric stranded (7 wires) bare copper. Conductors may be furnished as soft, medium hard-drawn, or hard-drawn in accordance with A.S.T.M. specifications. Rome Cable Corp., Rome, N .Y.

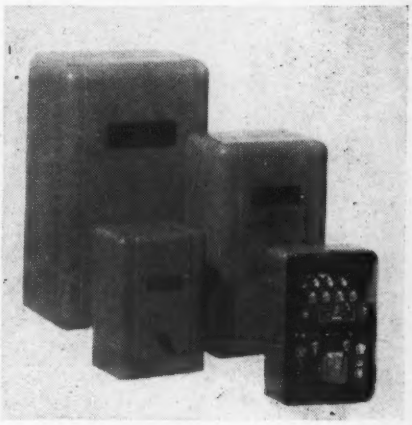
Soldering Tip

A low-cost, long-lived soldering tip, known as Duratip, has been announced. It gives more heating area, forms easily into any shape desired and does not overload transformer. Because of its flexibility, it can be bent easily into any shape, to go around corners or into tight spaces. It is designed especially for Weller guns, draws rated current, heats in five seconds, and cannot overload, damage or burn out the transformer. Also, since the working slug at tip end is an integral part of loop tip, slug cannot come loose or drop off. Weller Mfg. Company, Easton, Pa.



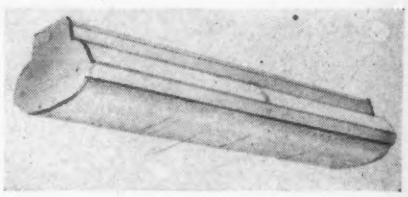
Control Center

A new dust-tight control center has been developed. The design combines standard, general purpose control center units with heavily gasketed vertical sections. Each vertical section is an independent enclosure of heavy gauge steel. A large, vault type door handle operates three-point, roller-guided locking bars which clamp the door into place. Units are mounted entirely within the dust-tight sections. Complete interchangeability simplifies maintenance and contributes to flexibility. Units are available with circuit breakers through 600 amperes, starters through NEMA Size 5, lighting transformers and panelboards and other miscellaneous devices as covered by NEMA standards. Master load and control terminal blocks are optional. Square D Company, 4041 North Richards Street, Milwaukee 12, Wis.



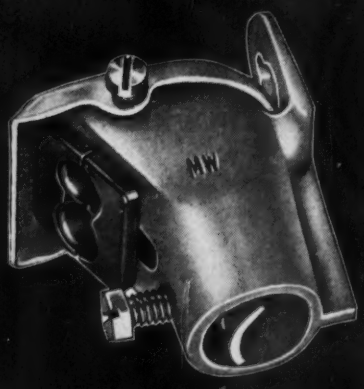
Magnetic Starter

A new line of a-c magnetic starters has been announced. Designed for starting and protecting motors up to 50 hp., the new full voltage starters are furnished in all NEMA sizes from 0 through 3. Contactors can be furnished in sizes from 00 through 3. Unit has one piece plastic encased coil enclosure which protects windings against dirt, moisture, or possible damage during installation. The clamp-type coil terminals are embedded in enclosure to prevent loosening. Starters are furnished either open or mounted in general purpose, watertight, dust-tight, or hazardous atmosphere enclosures. General Electric Co., Schenectady 5, N. Y.



Fluorescent Fixture

A new fluorescent fixture for surface-mounting has been announced. It has a streamlined overall contour, with a curved -type Controlens that provides a diffused, high quality light. A feature is the upper member—a reflector that works with lens and refractor to both eliminate ceiling shadows and to light up ceilings. Unit is for two, three or four 40 watt lamps and can be used singly or in continuous runs. Leader Electric Company, 3500 N. Kedzie Avenue Chicago 18, Ill.



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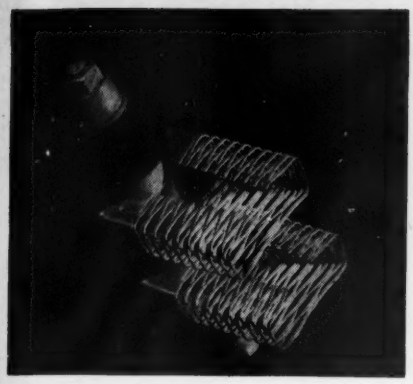
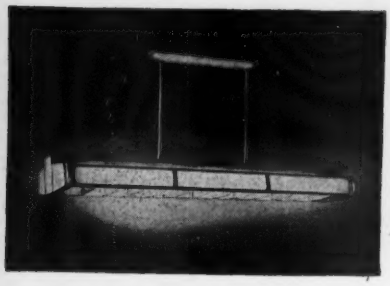


Resistor

A new type of resistor, "Multipath," employing a sturdy but light weight, mesh-type construction, is now in production in the United States. The element is based on the use of slit and formed alloy sheet. The resistor is distinguished by its use of precision-cut sheet metal for resistance instead of wires, ribbons, castings or stampings. Besides special services, it is adapted for motor starting and control, arc control, heating and all the usual applications for power-type resistors. For such applications it is available in the form of a line of standardized units, rated 20 to 80 amperes (4.5 to .3 ohms) as well as being supplied in special design where required. Exmet Electrical Corporation, 59 Park Avenue, New York, N. Y.

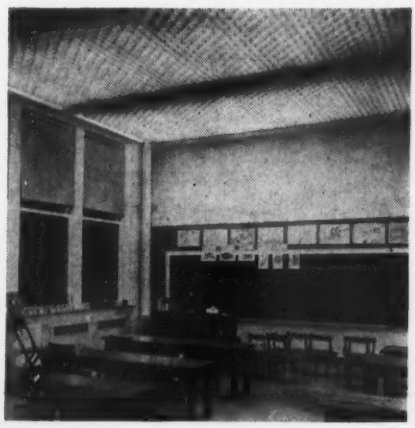


Fluorescent Unit

The Sentinel, a new fluorescent luminaire for single mounting, has been introduced. It is a four foot unit using four 40 watt fluorescent lamps. It is similar in design to the continuously mounted Grenadier II and IV, and can be used to match these units in rooms or corridors. Lamps are replaced either through the top or from the bottom of unit by lowering louvers hung from studs. Light distribution pattern can be controlled by addition of either solid topplate reflectors or slotted topplate reflectors allowing 8 percent of the light upward. F. W. Wakefield Brass Company, Vermilion, Ohio.

Tool

For the laying of electrical cable, the installation of connectors, and public utility service work, a new model of electric impact tool with a capacity for handling the heavier jobs has been announced. With standard accessories it will run and remove nuts up to $\frac{5}{8}$ inch thread size; drive and remove studs; extract broken cap screws and studs; apply and remove machine screws of all kinds; run wire brushes; drill brick, metal, and masonry; tap; and ream. It may also be used for woodboring. Known as the 8U, the new model has all the features and advantages of the smaller 4U model. Tool is $12\frac{1}{8}$ inches in length and weighs 9 lbs., 13 oz. It is available for either 110 or 220 volt and operates on a-c or d-c. Ingersoll-Rand Company, 11 Broadway, New York, N. Y.

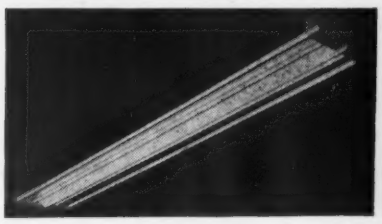


Lighting Fixture

A new fixture for lighting in school rooms, business offices and factories has been introduced. Called Cell-Ceil, it is a prefabricated, louvered, all steel material made up in honeycombed panels that fit together into a single continuous ceiling when hung below the lighting fixtures of an old ceiling. It eliminates glare below an angle of 45 degrees and delivers a diffused, even illumination when used with either incandescent or fluorescent lighting. Panels come in 24 or 30 inch widths and in lengths varying by six inch steps from 96 down to 12 inches. Cell-Ceil is a series of cold rolled strip steel ribbons .008 inches thick and two inches wide, set up on edge, corrugated into a series of even waves, then fastened together to form the honeycombed panels. Material is galvanized, bonderized and finished in pastel shades of baked enamel. Federal Enterprises, Inc., 8700 S. State Street, Chicago 19, Ill.

Meter

A new single phase combination watthour and thermal watt demand meter for industrial use has been announced. Designated as the Type IHM-1, it can be installed wherever rate structures require the determination of demand as well as energy, without increasing the size of the original installation. The revolutionary new damping system and electromagnet of the recently introduced I-50 watthour meter, adapted to the new design, comprise the watthour uniter of the Type IHM-1 meter. The thermal unit of the Type HI-1 thermal meter with its "direct heat" operating principle has been adapted for use as thermal demand unit of the new combination watthour and thermal watt demand meter. General Electric Company, Schenectady 5, N. Y.



Fluorescent Fixture

A new slimline fluorescent lighting fixture, designed for commercial use and suitable for stores, banks, institutional and public buildings has been introduced. The CSL-496 is an unshielded unit using four T8 fluorescent lamps. It can be installed either surface or pendant mounted, individually or in continuous row, but is especially applicable for surface mounting in general merchandising areas. Unit is 98 inches long and "blunt" end design of chassis eliminates shadows. End caps and joining bands do not have to be removed to service or relamp fixture. Sylvania Electric Products Inc., 500 Fifth Avenue, New York, N. Y.

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Built to stand plenty of hard use.
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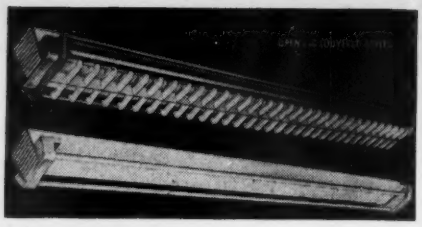
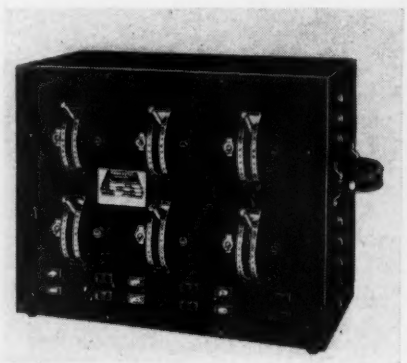


Lighting Fixture

A new two 40 watt Slimline fixture has been introduced. It is made up of two four foot sections that slide together to form a single, streamlined eight foot line of light. Sections slide onto individual mounting tracks and are fastened together by a few bolts and nuts. Unit features the "trunk lock hinge louver". A matching all metal louver unit hooks onto the basic four light fixture, and swings open and shut for maintenance. Sides are constructed to give the effect of translucent glass. Other operating advantages include flickerless instant-start (no starters required) and longer lamp life. Units may be mounted flush or pendant, individually or in continuous rows. Basic open type two-light unit is wired with 200 milliamp ballast and is also available with 300 milliamp ballast. It carries Underwriters approval and is for operation on 110-125 volt, 60 cycle, a-c. Mitchell Mfg. Co., 2525 Clybourn Avenue, Chicago 14, Ill.



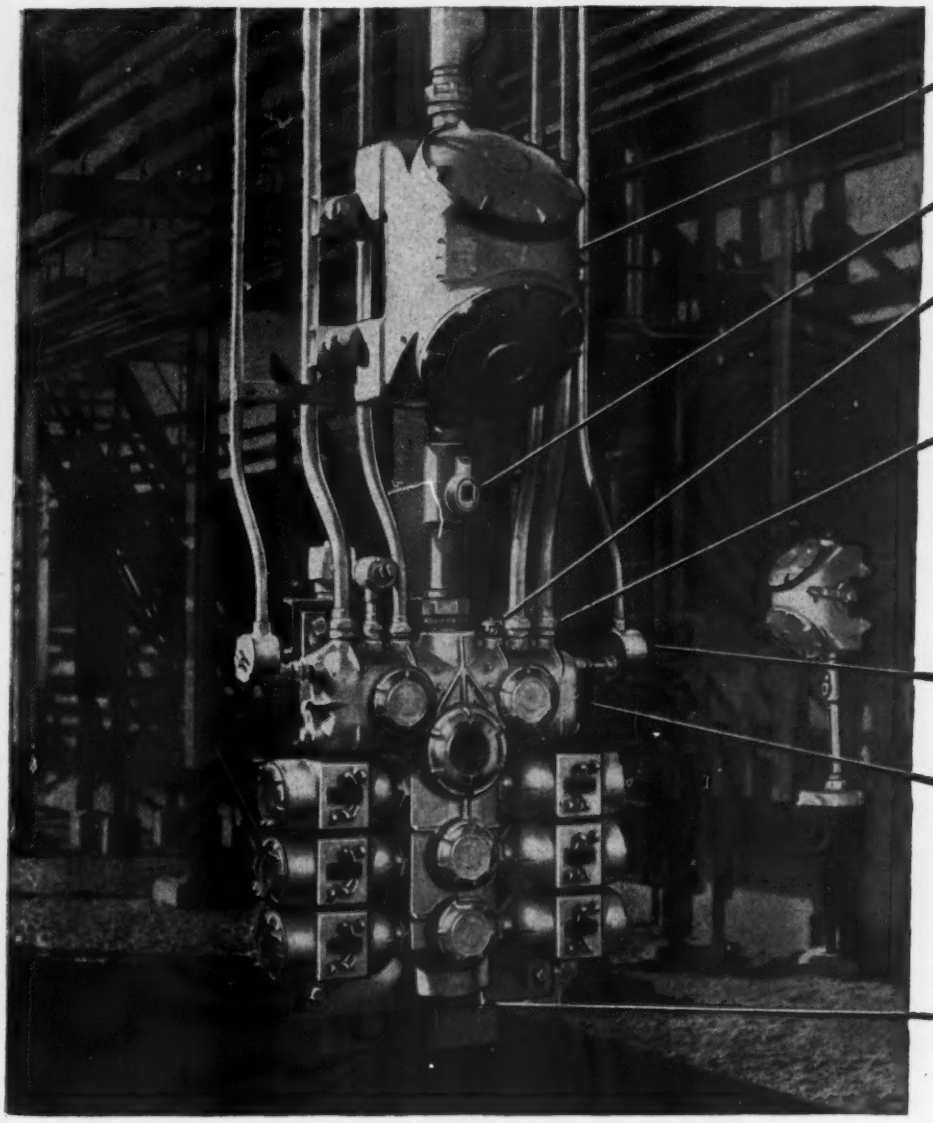
Theatre Dimmer

A new, six circuit "packaged" theatre dimmer has been added to this line of Powerstat theatre dimmers. Known as DBR6-850, it is equipped with leather carrying handles and can be moved from one location to another. Overall dimensions are 18⅞ inches wide, 14½ inches high and 9¼ inches deep. It was designed for operation in small theatres and by amateur theatrical groups. Unit consists of six 850 watt output auto-transformer type dimmers mounted in a case. Assembly operates from a three wire, single phase 230/115 volt, 50/60 cycle. A separate fuse protects each circuit. The six dimmers are noninterlocking. Superior Electric Co., 555 Hannon Ave., Bristol, Conn.

Explosion-Proof
CONDULETS

afford **maximum safety** from explosion and fire

(CONDULETS are made only by CROUSE-HINDS)



Type FLB Explosion-Proof Circuit Breaker Condulet protecting the main lighting feeder

Type EYS Sealing Condulet

Type ECD Breather Valve and Type ECD Drain (shown at bottom of panelboard) ventilate and drain the main wiring compartment

Type UNY Explosion-Proof Union

Type GUAB Explosion-Proof Junction Condulet

Type EDP Explosion-Proof 12-Circuit Lighting Panelboard

Type ECD Drain

Locations where flammable atmospheres are likely to be present are designated as hazardous by the National Electrical Code. The Code requires explosion-proof electrical installations in such locations. Crouse-Hinds Company manufactures hundreds of explosion-proof CONDULETS, lighting fixtures, plug receptacles, and other equipment that affords maximum safety by preventing explosion and fire.

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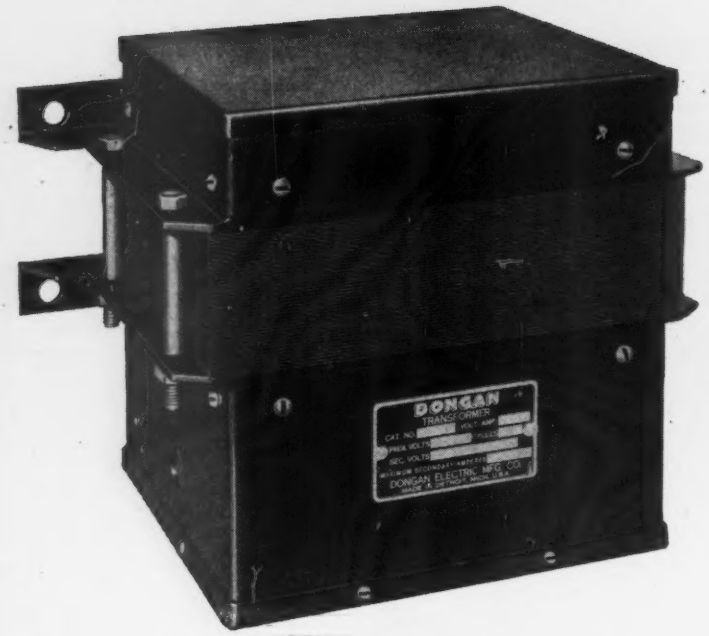

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DONGAN TRANSFORMERS

New Equipment Briefs

The Superior Electric Company, Bristol, Conn. has introduced a new 5-way **binding post** for permanent clamping; spade lug connection; plug-in for banana plugs; looping and clamping; and clip lead. . . . A new explosion-proof, 1200 hp., electric **motor** with rpm. rating of 5,000 to 20,000 under load and 10,000 to 40,000 free speed has been developed by Mission Electric Manufacturing Company, Pasadena, Calif. . . . The use of "Krypton, a rare atmospheric gas, had been adapted to a new 25 watt **fluorescent lamp** by Duro Test Corporation of North Bergen, N. J.

Potter Instrument Company, Inc., Flushing, N. Y., has announced a new high speed photo electronic **counter** for industrial applications. Counts at rates up to 6000 per minute. . . . A new **hacksaw frame** has been introduced by the Millers Falls Company, Greenfield, Mass. . . . Jasper Blackburn Products Corp. of St. Louis, Mo. has developed a new copper covered **ground rod.**

The Twin Disc Clutch Co. of Rockford, Ill. has announced a new hydraulic **power transmission unit,** called the hydro-sheave drive. . . . A hermetically sealed, frequency compensating **voltage stabilizer** of 15 watts rating, for an input frequency range of 57 to 63 cycles, input voltage of 925 to 125 volts and output of 115 volts has been added by Raytheon Manufacturing Company, Waltham, Mass. . . . A new 69-kv. oil blast power **circuit breaker,** featuring dual-flow, cross-blast interrupter and solder-seal bushings has been announced by General Electric Company, Schenectady, N. Y.

A new angle-**screw driver,** has been developed for telephone workers by the Greenlee Tool Co., Rockford, Ill. . . . Bi-Seal, a new self-bonding electrical **insulating tape,** has been announced by the Bishop Gutta Percha Company, New York, N. Y. . . . A new automatic single circuit motor generator **battery charger** for motive power batteries, known as the "Charge-O-Matic" has been developed by the Hertner Electric Co., Cleveland, Ohio.

Moe-Briges Corporation, Sheboygan, Wis., has announced one and two lamp **spotlights** designed for light-in line, louvershield fixtures for individual or in-a-line mountings. . . . Announcement of the development of a new tripod type, welded all-steel **shear stand** has been made by the Beverly Shear Mfg. Co. of Chicago. . . . A new and improved **electric drill,** known as "Hole-Shooters", available in three different drill size capacities and five rated speeds, has been developed by Milwaukee Electric Tool Corporation, Milwaukee, Wis.

A new line of fractional hp. **motors** for jet-pumps in ratings of ¼, ⅓, ½, ¾ and 1 hp. has been announced by General Electric Company, Schenectady, N. Y.

Good Lighting

THE MODERN PATHWAY TO SALES

Designers agree that the newest in store design calls for a lighting system that is planned to bring in sales.

Electricians agree that even the best designed system can't keep on building sales unless the wiring that goes into it is selected to give long-term, dependable service. Heat-beating Deltabeston is approved for use at temperatures as high as 125 C (257 F)—and it's built to cut troubles due to moisture.

Deltabeston, Type AF, fixture wire is flexible for easy handling, without injury to insulation. It's easy to strip for fast work. Smooth-finished, it fits easily into fixtures and other assemblies.

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DELTABESTON*

A new Deltabeston service. If desired, Deltabeston fixture wire can be supplied with ends tinned, ready to install. Completely eliminated are the bother and trouble that go with measuring and cutting wire to length, stripping and twisting ends, and tinning. And, the cost is so slight it will amaze you. For more information, fill in the coupon below.

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Construction Materials Department
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The trend not only is unmistakably to louvered ceilings of light . . . but to ceilings with LUMINOUS LOUVERS!

When you experience the lighting effect achieved with luminous louvers it's not hard to understand why those who *see* it, so overwhelmingly *prefer* it!

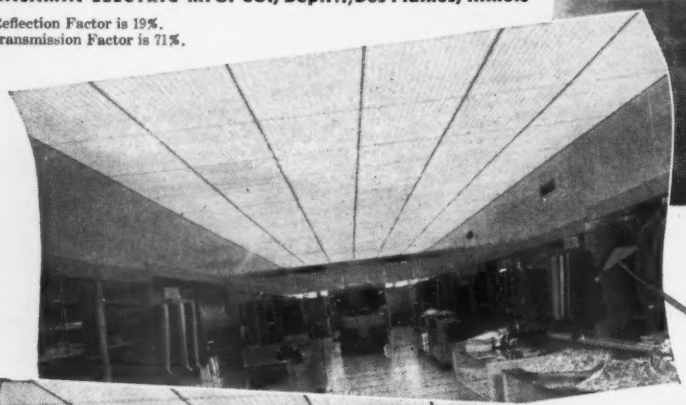
The secret of "Sky-Glo's" superiority is in its exclusive Vinylite (plastic) louvers which not only reflect light but also transmit light.* Thus "Sky-Glo" provides a translucent ceiling that not only affords a means of obtaining more light without annoying glare but actually offers a new experience in seeing!

"Sky-Glo" makes possible these high levels of illumination (in range of 50 to 150 footcandles) with exceptional low brightness (less than 1 footcandle per sq. in.). The result: a soft glareless illumination that makes seeing easy; that creates a restful yet stimulating atmosphere; that makes one completely unaware, visually and psychologically, of the high levels of illumination that are responsible for this "new experience in seeing."

Translucent "Sky-Glo" louvers heighten the beauty of the ceiling and add a scintillating and harmonizing note to the entire decorative scheme. Add to these exclusive advantages of "Sky-Glo" all of the many conventional advantages of the louverall lighting system and you can see why the new trend in lighting is so definitely to Benjamin "Sky-Glo."

BENJAMIN ELECTRIC MFG. CO., Dept. H, Des Plaines, Illinois

*Reflection Factor is 19%.
Transmission Factor is 71%.



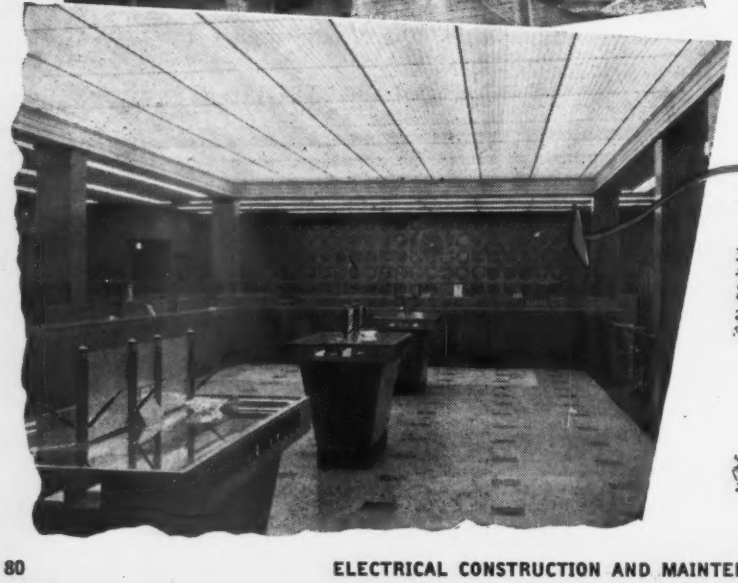


Illustration above—the reception room of Cluett, Peabody and Company, Inc., 10 E. 40th Street, New York, N. Y. Designed by Robert Heller, Industrial Designer, New York City.

Illustration left—Wright Clothing Store, Greensboro, N. C. Designer and Contractor: Starr Electric Co., Greensboro, N. C.

Lower left illustration—Main Banking Area, Central Trust Company, Rochester, N. Y., Consulting Architect, A. G. Alexander, New York City.

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Principles of Battery Charging

By J. J. Unger
Assistant Chief Engineer
The Electric Products Company
Cleveland, Ohio

DURING the past ten years, a much broader concept of the economies to be realized by mechanized material handling has been achieved. It has been demonstrated that enormous savings and production improvement can be obtained by proper and efficient material handling. The movement of the product, from its raw condition to its finished state, has become recognized as a production tool, and as such, deserving of the same attention and study given to all other machine tools and production processes. While the surface has only been scratched, continued research on the subject indicates a greatly expanding use of modern material handling equipment.

The battery powered electric industrial truck has been a major factor in the progress and growth of this field. Its adaptability and operating features make it an ideal instrument for handling raw, semi-processed, and finished materials.

To obtain maximum utilization and satisfaction from the battery powered electric truck, it is essential that its source of power, the storage battery, be charged in such a way as to secure longest battery life at highest battery efficiency. This result can be accomplished by charging the battery at all times well within the current rates which research and past experience have determined to be most satisfactory. A storage battery can stand an unusual amount of abuse and deliver an enormous amount of power on discharge, if it is properly maintained and properly recharged. It is evident, therefore, that a familiarity with the proper battery charging methods, will pay dividends in battery life and satisfaction.

There are two types of storage batteries used in the electric industrial truck; the lead-acid battery and the nickel-iron-alkaline battery more commonly known as the Edison battery. Since the charging characteristics of these two types of batteries differ, we will consider them individually.

THE LEAD-ACID BATTERY

In recharging lead-acid batteries, it may in general be said that any charging rate is permissible which does not produce excessive gassing nor a cell temperature exceeding about 110°F. It has been observed that these limitations are normally complied with if "the charging rate in amperes never exceeds the value of the ampere-hours

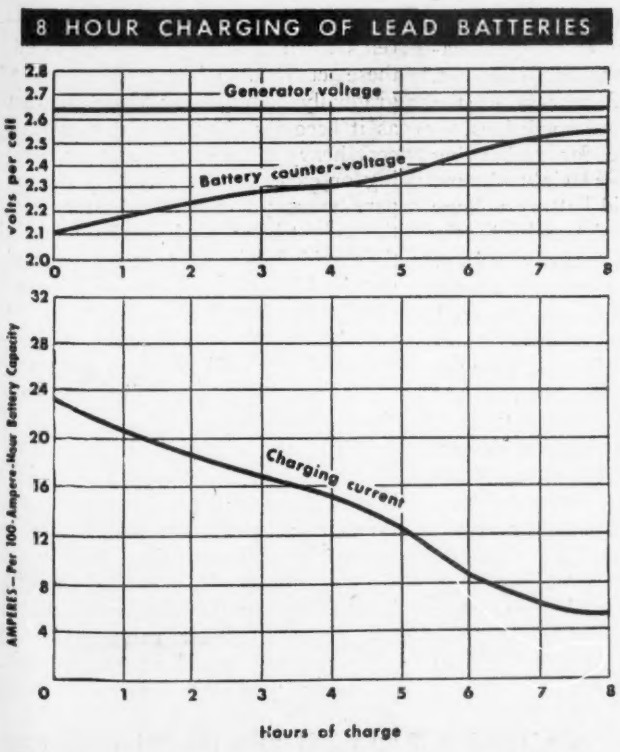

FIG. 1—Charging characteristics of a one cell 100 amp. hr. battery on 2.63 volts through .022 ohms.

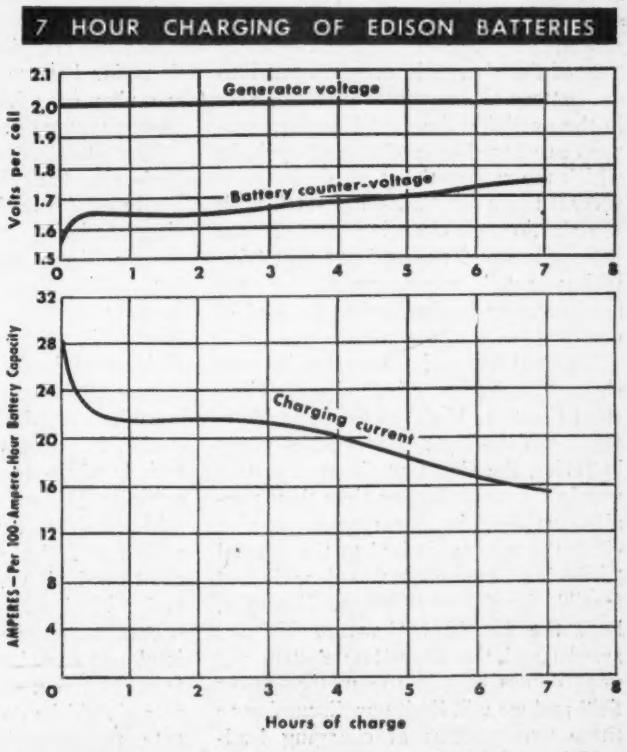

FIG. 2—Charging curve for a one cell 100 amp. hr. Edison battery by Modified Constant Voltage method.

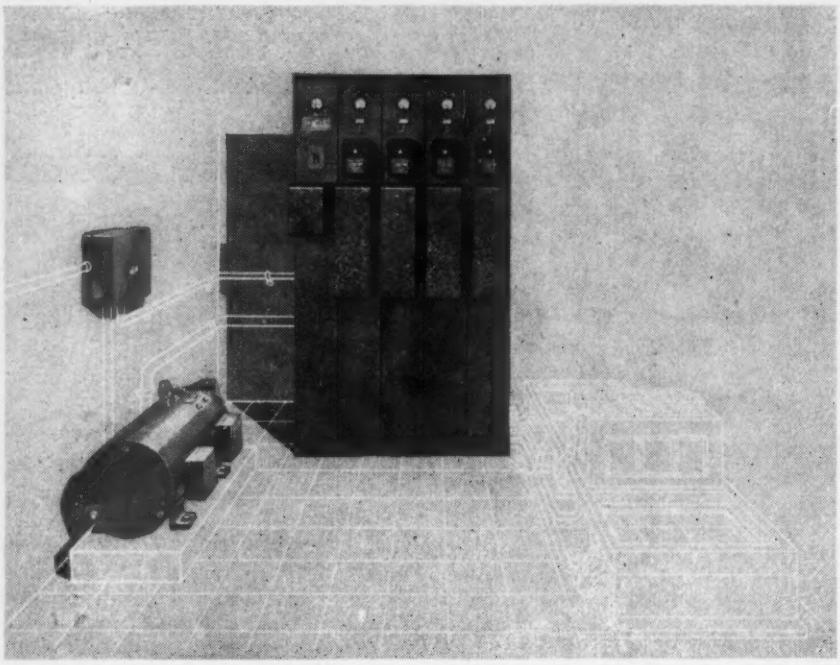

FIG. 3—Fully automatic charging equipment for recharging four batteries simultaneously.

out of the battery measured from the full state of charge." Any method of charging that keeps the current within this limit will not overheat the battery nor cause it to gas appreciably. It follows then that as a lead-acid battery approaches the full charge condition while on charge, it is necessary that the charging current rate be at a low value to comply with this rule. In order to charge the battery in any reasonable time, it also becomes necessary that the charging current rate be substantially higher during the early part of the charge in order to put into the battery the required ampere hours in the available time. All modern systems are based on a charging cycle in which the rate at the start of charge is several times the "finishing rate" with a reduction of charging rate as the battery becomes charged until the "finishing rate" recommended by the manufacturer is obtained at the end of charge.

Three systems of charge usually considered for lead-acid batteries are Constant Current, Modified Constant Voltage and Two-Rate. For motive-power batteries, the Constant Current system requires a much longer time than usually available in this type of service since the rate is limited to the normal "finishing" rate and therefore is not feasible for this application. However, both the Modified Constant Voltage system and the Two-Rate system are used extensively in the motive-power field and we will limit our discussion to these two systems of charging lead-acid batteries.

The *Modified Constant Voltage* system consists essentially of a unit for converting the normal alternating current power source to a closely regulated direct current of proper voltage, connected to the battery through a calibrated ballast resistor. It is essential in this type of charging that the direct-current voltage is held within very close limits under all conditions of temperature and current load conditions. The limits specified by the battery manufacturers and by The Electric Industrial Truck Association, which has compiled complete specifications for battery charging equipment, are plus or minus 3 percent of the proper voltage under all conditions.

The standard time for recharging lead-acid batteries is eight hours. Study of the lead-acid battery voltage characteristic has determined the proper direct current supply voltage for modified constant voltage charge in eight hours to be 2.63 volts per cell. With this voltage the value of ballast resistor to be inserted in series with a one-cell battery of 100 ampere-hour capacity should be .022 ohms.

Fig. 1 indicates the charging characteristic of a one-cell, 100 ampere-hour capacity battery when connected to a 2.63-volt, direct-current power supply with a .022-ohm resistor in series. As mentioned above, the most important and critical part of the charging cycle occurs near the end when the battery is almost completely charged. It is at this point that the "charging" current rate should be down to the "finishing" rate recommended by the manufacturer. This finishing rate is 5 amperes per 100 ampere-hour battery capacity. As shown in Fig. 1, it requires a voltage of 2.52 across the cell to cause a 5-ampere charging current to flow. Since the charging bus voltage is 2.63 volts the difference between this bus voltage and the 2.52 volts across the terminals or .11 volts is dissipated by the ballast resistor. By Ohms' law dividing .11 volts by the ballast resistance of .022 ohms will allow a current of 5 amperes to flow so that this .022 value of resistor will limit the "finishing" current to 5 amperes as long as the charging bus voltage of 2.63 volts is maintained. Now looking at the first part of the curve, when a discharged battery is first put on charge it requires only 2.135 volts across the cell to cause a starting current to flow. This will mean that the difference between the charging bus of 2.63 volts and the voltage of 2.135 volts required across the cell or .495 volts is to be dissipated by the ballast resistor. Again by Ohms' Law, dividing .495 volts by .022 ohms will cause a current of 22.5 amperes to flow.

As can be seen in Fig. 1, the battery countervoltage rises as the battery becomes charged resulting in a reduction of the charging current into the battery until the battery has become fully charged, at which time the charging rate is 5 amperes per 100 ampere-hour battery capacity. This is the recommended "finishing" rate. It is this feature of the rising battery countervoltage that makes the modified constant voltage system possible and recommended since the battery acts as its own regulator, accepting high currents when it is in a condition to take these currents without damage and gradually diminishing these currents as it becomes charged and cannot accept heavy currents without overheating or excessive gassing. If the ampere-hours put into the battery over this eight-hour period are recorded they will be found to total approximately 110 ampere-hours which completely restores the original 100 ampere-hours into the battery with 10 ampere-hours additional to take care of difference between discharge and charge efficiency.

While the standard time for recharging lead-acid batteries is eight hours, it occasionally becomes necessary in a particular installation to charge in a shorter time, perhaps in six or seven hours. On first thought, it would appear that simply raising the voltage to a higher value than 2.63 volts per cell would accomplish this. However, just the reverse is true. Raising the voltage to a value higher than 2.63 volts per cell would mean that the ballast resistor value would have to be increased in order to still

maintain the required "finishing" rate of 5 amperes per 100 ampere hour of battery capacity. This higher ballast resistor value would limit the "start" rate of the battery to a lower value than we obtain under the eight hour charging condition, so that actually the charging time would become longer than eight hours to restore the battery to its fully charged condition. Actually, to charge a battery in less than eight hours requires a bus voltage lower than 2.63 volts per cell and a correspondingly lower ohmic value of ballast resistor. This combination will result in the proper "finishing" rate and still allow a higher "start" rate with the net result that the required ampere hours are put into the battery in a shorter period than eight hours.

It is generally not recommended to charge in a period less than eight hours. One objection is that the size of the charging equipment, and consequently the price, increases very rapidly for shorter-time charging. Another problem due to shorter-time charging results from the fact that the ohmic value of the ballast resistor becomes so small, and the value of the bus voltage approaches so closely to battery voltage, that any small variation in bus voltage produces a very great change in charging current since the effect of the ballast or "cushioning" resistor has been materially reduced. Charging in less than eight hours becomes a much more critical operation and is not recommended unless necessary.

The values of voltage and current shown in Fig. 1 are all based on one cell of 100 ampere-hour capacity with a ballast resistor of .022 ohms. For more cells the voltage would be directly proportional to the number of cells, e.g. for 10 cells the proper bus voltage would be 10 × 2.63 or 26.3 volts. For different ampere-hour capacity battery, the current is directly proportional to the ampere-hour capacity and the ohmic value of ballast resistor is inversely proportional to the ampere-hour capacity and directly proportional to the number of cells. For example, a 10-cell, 400 ampere-hour battery to be charged in eight hours by the modified constant voltage method would require a constant voltage bus of 10 × 2.63 or 26.3 volts. The start rate amperes would be 400/100 × 22.5 or 90 amperes. The ohmic value of ballast resistance would be 100/400 × .022 or .055 ohms. The finish rate would be 400/100 × 5 or 20 amperes. Table I indicates the proper value of bus voltage, charging current, and ballast resistor required for various charging times.

For charging single batteries, it is possible to incorporate in the charging equipment a volt-ampere characteristic duplicate of that shown for the battery in Fig. 1 without the use of a ballast resistor. This means that the voltage of the generator will rise as the current load tapers off exactly as indicated by the volt-ampere curve of the battery, with the net result that the charging current curve into the battery is the same as that shown in Fig. 1. This is referred to as a shunt-wound generator and is the most common design used today for charging single batteries. However, when more than one battery is to be charged from the same equipment, they cannot be charged by this method, but must be charged by the modified constant voltage or two-rate method.

While the usual method of charging lead-acid batteries in motive-power

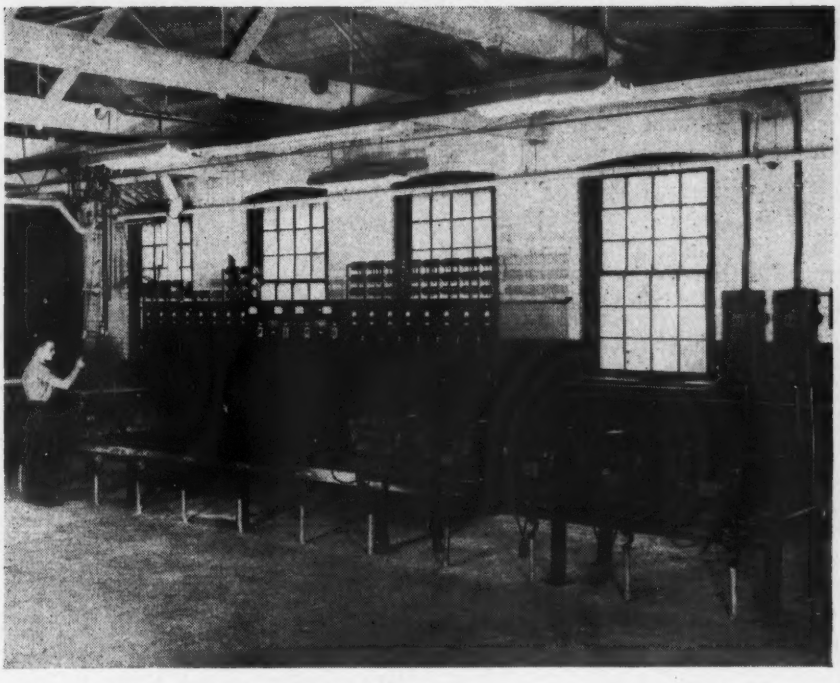

FIG. 4—Big installation may involve two or more m-g sets and grouped charging apparatus as in this 16 circuit job.

TABLE I

Modified Constant Voltage Taper Charging—Design Constants

For Lead-Acid Type Batteries

Design constants based on 100 ampere-hour cell capacity. For cells of other capacity, external resistance per cell will be inversely proportional and ampere values directly proportional to the capacity.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
						Control Adjustment	
Hours Available for Recharge	Bus Volts per Cell	Resistance Values Per Cell		Ampere Rates Per 100 A. H.		Voltage-Time Relay	Amper Hour-Meter % Overcharge
		Normal "Tap"	Max. to Provide	Start of Charge	Resistor Capacity		
7.0	2.60	0.016	0.027	27.5	32.5	2.5–3.0 Hr.	10.%
7.5	2.61	0.018	0.029	25.5	30.0	2.5–3.0 "	"
8.0	2.63	0.022	0.031	22.5	26.0	2.5–3.0 "	"
8.5	2.65	0.026	0.035	20.0	23.0	2.0–2.5 "	"
9.0	2.67	0.030	0.039	18.5	21.0	2.0–2.5 "	"
9.5	2.69	0.034	0.043	17.0	19.5	2.0–2.5 "	"
10.0	2.72	0.040	0.049	15.5	17.5	2.0–2.5 "	"
12.0	2.84	0.064	0.073	12.0	13.5	2.0–2.5 "	"
14.0	3.00	0.096	0.105	10.0	11.0	2.0–2.5 "	"
16.0	3.27	0.150	0.160	8.5	9.0	2.0–2.5 "	"

NOTE: Referring to Column No. 8. With ampere-hour meter control, the compensating resistor should be adjusted to produce a 10% overcharge.

NOTE: The time period in Column No. 7 indicates the range of suitable settings for the time switch in the voltage-time relay device.

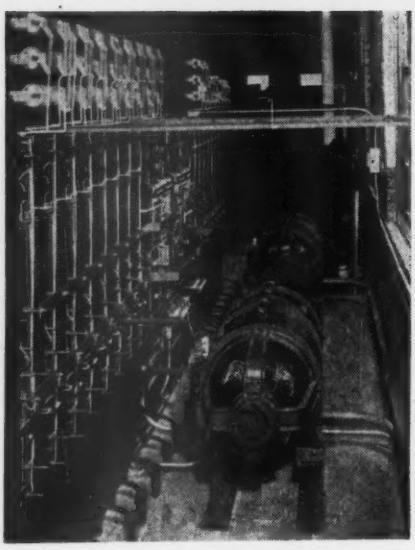

FIG. 5—Motor generators are arranged for automatic paralleling matched to load.

service is by the "Modified Constant Voltage" (a constant generator voltage of 2.63 volts per cell and a ballast resistor) system, cases frequently occur where the charging bus voltage for a given charge period is in excess of 2.63 volts per cell and longer than eight-hour charging periods are not satisfactory. When the charging bus voltage is somewhat higher than 2.63 volts per cell, batteries cannot be charged by the Modified Constant Voltage system and under such conditions, the Two-Rate system of charging is employed. This system is a charging circuit provided with automatic means for reducing the charging rate when the battery attains a certain state of charge. Under this system the ballast resistor is adjusted to charge the battery at such a rate as to put into the battery about 80 percent of full charge in about four hours, at which time additional ballast resistor must be introduced into the circuit to reduce the charging current to the safe "finishing" rate for the remaining 20 percent charge. This system is especially adapted to charging batteries where a commercial direct current source is available but at a potential too great for normal modified constant voltage charging. It is also used where there is a mixed number of cells per battery in a fleet and only one charging bus available. In these cases the voltage of the charging bus is determined by the battery with the maximum number of cells and these batteries are charged by the Modified Constant Voltage system. The batteries of lesser number of cells are then charged by the Two-Rate system from this charging bus.

The standard time for charging nickel-iron-alkaline batteries is seven hours. The ideal charge for this type of battery is by the constant current method at normal current rates. This battery does not require a low "finishing" rate as required by the lead-acid battery, so that the current rate can be kept at one value all during charge.

For most charging installations the modified constant voltage system is most suitable. Under this system, best efficiency and satisfactory charging rates are obtained by using a bus voltage of two volts per cell. With this value of bus voltage and proper ballast resistor for the type of cell being charged, we obtain a charging current rate that is approximately 140 percent of normal current at the start of charge. This gradually tapers off until at the end of the charge, the charging current rate is 78 percent of normal current.

Fig. 2 illustrates a typical charging curve for a one-cell, 100-ampere-hour Edison battery from a bus voltage of two volts per cell by the Modified Constant Voltage method, using the proper ballast resistor.

Any value of bus voltage that is 1.84 volts per cell or more can be used. Since, in charging nickel-iron-alkaline batteries, it is not necessary to obtain a low "finishing" rate, as in the case of the lead-acid, the two-rate system is never used, no matter how high the bus voltage. It is merely necessary to insert enough ballast resistor to limit the average charging current to the normal current for the particular type of cell being charged. Table II indicates the proper values of ballast resistors and charging currents for various bus voltages.

The above represents an outline of the various methods commercially used to charge motive-power batteries. Rather than discuss the controls used to regulate the charge, we will just set down the minimum requirements which the controls should accomplish to provide automatic charging.

1—Automatic independent cut-off for each battery when fully charged.

2—Automatic disconnection of the charging equipment from the power line and opening of all charging circuits in case of a line interruption.

3—Automatic restart of the charging equipment upon resumption of power following an interruption.

4—Automatic control of charging rate.

5—Automatic shut-down of charger when last battery is charged.

TABLE II

Table for Modified Constant Potential Charging Nickel Iron-Alkaline Batteries

Bus Volts.....	1.84	1.90	1.95	2.00	2.05	2.10	2.20	2.30	
Initial Rate (% normal)..	165	155	147	140	134	128	124	120	
Final Rate (% normal)..	65	70	74	78	81	84	86	88	
Cell Type	OHMS PER CELL								Normal Rate Amps.
A4.....	.00500	.00700	.00867	.01033	.01200	.01367	.01700	.02033	30.0
A5.....	.00400	.00560	.00693	.00827	.00960	.01093	.01360	.01627	37.5
A6.....	.00333	.00467	.00578	.00689	.00800	.00911	.01133	.01356	45.0
A7.....	.00286	.00400	.00495	.00590	.00686	.00781	.00971	.01162	52.5
A8.....	.00250	.00350	.00433	.00517	.00600	.00683	.00850	.01017	60.0
A10.....	.00200	.00280	.00347	.00413	.00480	.00547	.00680	.00813	75.0
A12.....	.00167	.00233	.00289	.00344	.00400	.00456	.00567	.00678	90.0
A14.....	.00143	.00200	.00248	.00295	.00343	.00390	.00486	.00581	105.0
A16.....	.00125	.00175	.00217	.00258	.00300	.00342	.00425	.00508	120.0
A20.....	.00100	.00140	.00173	.00206	.00240	.00273	.00340	.00406	150.0
A24.....	.00083	.00116	.00144	.00172	.00200	.00228	.00283	.00339	180.0
B1.....	.04000	.05600	.06933	.08270	.09600	.10933	.13600	.16267	3.75
B2.....	.02000	.02800	.03467	.04133	.04800	.05467	.06800	.08133	7.50
B4.....	.01000	.01400	.01733	.02067	.02400	.02733	.03400	.04067	15.0
B6.....	.00667	.00933	.01156	.01378	.01600	.01822	.02267	.02711	22.5
C4.....	.00333	.00467	.00578	.00689	.00800	.00911	.01133	.01356	45.0
C5.....	.00267	.00373	.00462	.00551	.00640	.00729	.00907	.01084	56.25
C6.....	.00222	.00311	.00385	.00459	.00533	.00607	.00756	.00904	67.50
C7.....	.00190	.00267	.00330	.00394	.00457	.00521	.00648	.00775	78.75
C8.....	.00167	.00233	.00289	.00344	.00400	.00456	.00567	.00678	90.00
C10.....	.00133	.00187	.00231	.00276	.00320	.00364	.00453	.00542	112.50
C12.....	.00111	.00156	.00193	.00230	.00267	.00304	.00378	.00452	135.00
D4.....	.00250	.00350	.00433	.00517	.00600	.00683	.00850	.01017	60.0
D5.....	.00200	.00280	.00347	.00413	.00480	.00547	.00680	.00813	75.0
D6.....	.00167	.00233	.00289	.00344	.00400	.00456	.00567	.00678	90.0
D7.....	.00143	.00200	.00248	.00295	.00343	.00390	.00486	.00561	105.0
D8.....	.00125	.00175	.00217	.00258	.00300	.00342	.00425	.00508	120.0
D10.....	.00100	.00140	.00173	.00206	.00240	.00273	.00340	.00406	150.0
D12.....	.00083	.00116	.00144	.00172	.00200	.00228	.00283	.00339	180.0

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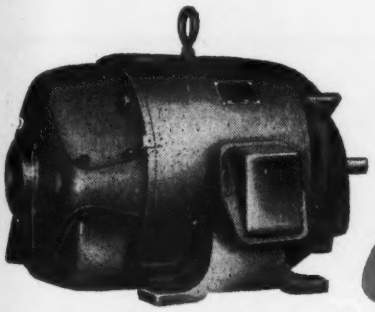

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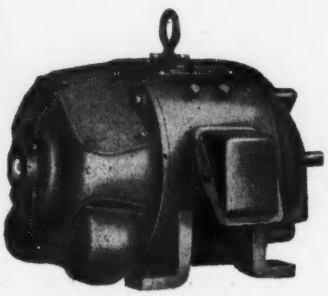

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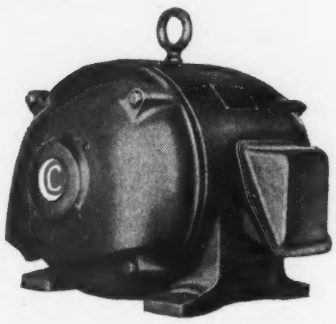

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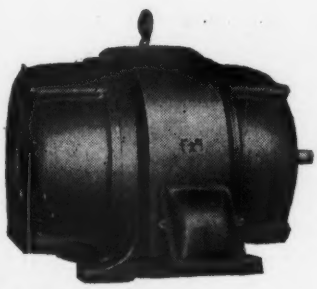

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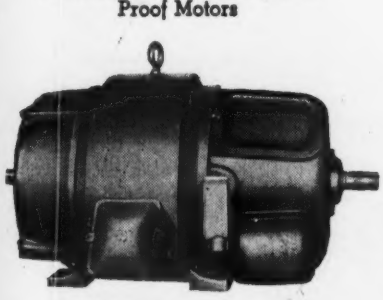

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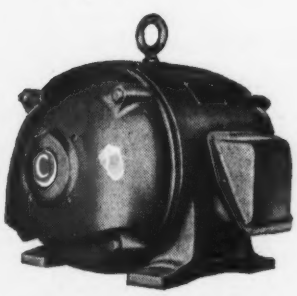

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Reader's Quiz

Synchronous Clock

QUESTION 302—Can someone suggest a simple way of slowing down an electric clock (self starting synchronous) motor which gains 10 minutes in 24 hours?—E.J.K.

A. TO QUESTION 302—A synchronous clock cannot be readily slowed down. Evidently the wrong assembly of gears was used in the clock. About the only logical way is to change the gear or gears to the correct ones. Of course, it may happen that you are on a power system in which the frequency is not regulated very close. This can be checked by taking another synchronous clock and see if it runs correct or gains the same 10 minutes.—L.R.B.

A. TO QUESTION 302 — The single-phase synchronous clock motor runs at absolutely (I don't mean nearly) constant speed as long as the frequency of the current is constant and the load is not too great. If overloaded, it stops completely and must be started by outside power before it will run again.

Therefore, I would suggest that you check the frequency of the power system and see if it is between 59.994 and 60.006 cycles (in a 60-cycle a-c system) or check with another clock. At 60.3 cycles it would gain about 7½ minutes a day.

The new up-to-date powerhouse controls the frequency very accurately, perhaps in your locality it might vary slightly. It must be remembered that the accuracy of the motor is no greater than that of the frequency of the electrical system to which it is connected. —R.D.R.

A. TO QUESTION 302—No synchronous motor can go faster than the frequency of the circuit driving it.

If the clock you mention is built correctly, to run on 60 cycles it must keep in synchronism. Under large variations in voltage it may lose a few cycles; it cannot gain.

I would advise checking the frequency of the system. If the system to which you are connected is not regulated by a standard Western Union clock or connected to some other system so regulated, it is quite possible that the frequency is a little high.

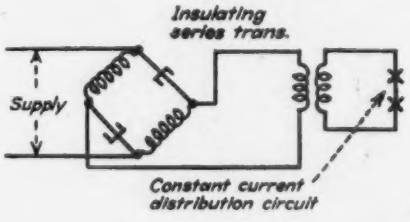
Isolated systems are sometimes regulated by keeping the pointer of the frequency indicator exactly on 60. The instrument might be a little off, or there may be a slight error in the reading of it. This might easily cause the slight error you note.

Ten minutes in 24 hours is an error of only .007% which gives a frequency of 60.42 cycles per sec. The frequency indicator could be that much off. 7/10 of one percent is not a very big error. It might be caused by what is known as "the human error".—A.E.T.

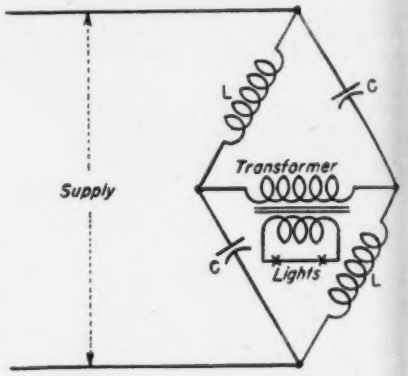
A. TO QUESTION 302—If the synchronous clock is of the same cycle rating as that of the utility, it is evident that the utility is not correcting the total cycles or rpm. of their generators over the 24 hour period as a large utility does. I'd suggest that E.J.K. call the utility and determine whether this is so. Synchronous clocks or any other synchronous motors inherently cannot operate at greater speeds than that determined by the frequency of the supply.—J.C.

Constant-Current Transformer

QUESTION 303—A recent installation of series lighting uses a type of constant current transformer with which I am unfamiliar. This diagram of the transformer is shown above. There are no moving parts. How does it work, on what theory?—L.R.D.

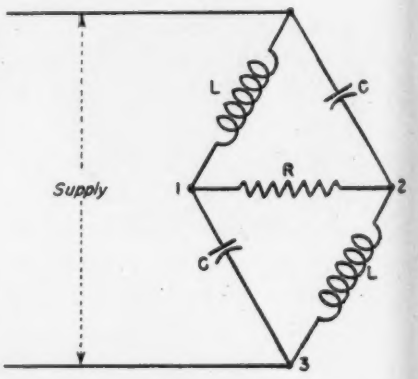


A. TO QUESTION 303—The circuit in question is a constant current lattice in which $\frac{1}{wc} = wl$ or $xc = xl$



To make the explanation of this circuit simpler, let the transformer and lights be replaced by an equivalent resistance R which would be determined by the turns ratio of the transformer and the number and size of the lamps used in the secondary circuit.

The modified circuit is

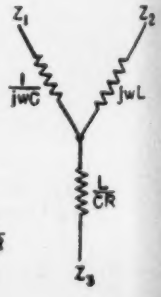


Convert either delta to a wye configuration.

$$Z_1 = \frac{R\frac{1}{jwL}}{R+\frac{1}{jwC}+jwL} = \frac{1}{jwC}$$

$$Z_2 = \frac{Rjwl}{R+\frac{1}{jwC}+jwL} = jwL$$

$$Z_3 = \frac{jwL/jwC}{R+\frac{1}{jwC}+jwL} = \frac{C/L}{R} = \frac{L}{CR}$$



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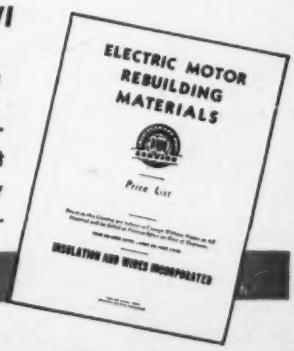
Page after page listing hundreds of items for easy finding, easy ordering, all clearly priced so you know what you're paying. Also shown are many time-saving money making equipment items. It's a Repair Shop Buyers Guide—



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At Last! AN ALL-PURPOSE*

Here at last is a dependable, economical insulating varnish that gives outstanding results in all applications except high speed armatures. It's General Electric's new 9574—with characteristics which make it ideal for a wide range of insulating applications. Look at the remarkable features it combines!

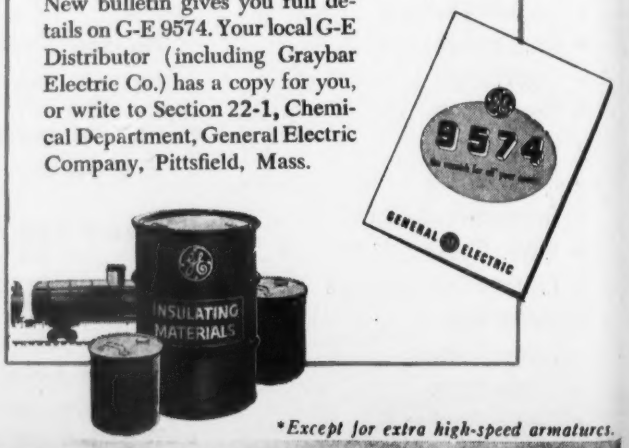
Used for Every Type of Winding A simple cure develops excellent physical and electrical characteristics in G-E 9574. That's why it has so many applications. It is particularly suited for repair work. It can be used on every type of winding, including enamel, cotton, asbestos, glass, and Formex.

Easier to Work G-E 9574 is a phenolic drying-oil varnish. Especially easy to use and handle, yet it gives maximum protection as a general-purpose insulation. It has an unusually high flash point of 100 F. And its viscosity of 250 C. P. average (at 45 F) makes G-E 9574 usable at barrel gravity. But you can thin it up to 20% with petroleum spirits.

Cures at Lower Temperature This clear-baking varnish cures at a much lower temperature than most synthetics having similar properties. A baking cycle as low as 212 F is successful in conventional equipment. G-E 9574 lends itself readily to infra-red baking. It sets up into a tough, pliable mass even in the deepest coils. Aging properties are excellent.

FIND OUT MORE

New bulletin gives you full details on G-E 9574. Your local G-E Distributor (including Graybar Electric Co.) has a copy for you, or write to Section 22-1, Chemical Department, General Electric Company, Pittsfield, Mass.



*Except for extra high-speed armatures.

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GENERAL ELECTRIC

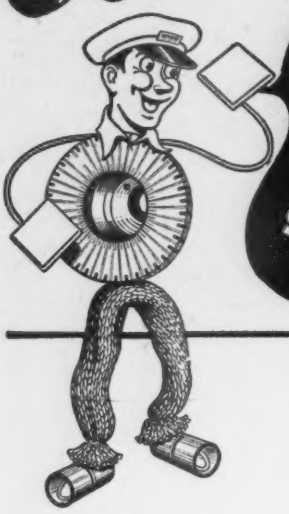
ELECTRICAL EQUIPMENT IS NO BETTER THAN ITS INSULATION

INSULATING VARNISH!

G-E's new 9574

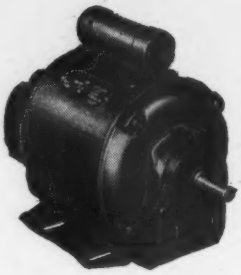
ELECTRICAL EQUIPMENT IS NO BETTER THAN ITS INSULATION

Genuine Joe says -

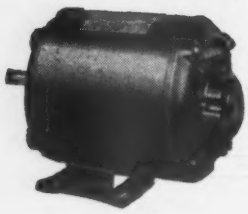


Motors too Costly to repair can be economically replaced with WAGNER *Service Exchange* Motors

Capacitor-Start Motors 1/6 to 1/3 horsepower inclusive.



Repulsion-Start Induction Motors 1/6 to 5 horsepower inclusive.



Many motors that come to your shop are "too far gone" to repair economically—or perhaps your customer needs *right-now* service. Replace them with Wagner Service Exchange Motors. These motors are fully guaranteed against defective material or workmanship for one year.

Be profit-wise—keep a stock of Wagner Service Exchange Motors on hand, to take care of emergencies, and build lasting customer satisfaction.

LOOK FOR THESE SIGNS AT YOUR SUPPLIERS...

They identify the 450 Authorized Service Stations and Parts Distributors who handle *genuine* Wagner Service Exchange Motors and repair parts.

***Write for* CATALOG MU-40**

Every repair shop needs one. It helps determine the catalog number and price of Wagner Motor Parts.

Wagner Electric Corporation
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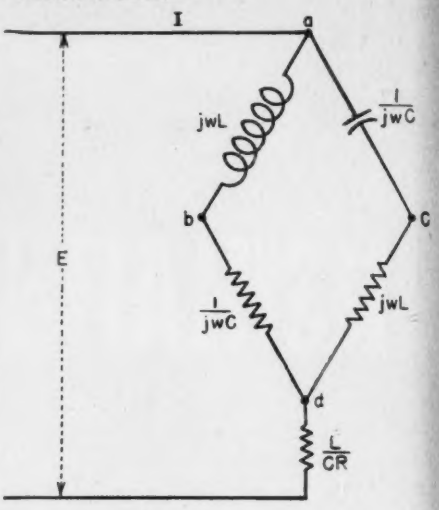
ELECTRICAL EQUIPMENT AND AUTOMOTIVE BRAKE PRODUCTS

M549-1

Replacing the delta with the wye, the circuit becomes



The equivalent Z of the above circuit is

$$\frac{L}{CR} \text{ since, } \frac{1}{jwc} + jwl = O.$$

Thus the impedance of the (parallel circuit)

$$Z \text{ a to } d = \frac{(O)\ (O)}{O + O}$$

$I = \frac{ERC}{L}$ Current in either branch of the parallel combination is $\frac{ERC}{2L}$

since the impedance of each branch is equal to the other.

$$Eab = Iab\ Zab\ Eab = \frac{ECRjwL}{2L} = ECRjw$$

$$Eac = Iac\ Zac\ Eac = \frac{ERC}{2LjwC} = \frac{ER}{2jw}$$

Voltage across $R = Eab + Eac =$

$$\frac{ER}{2jwL} + \frac{ECRjw}{2} = \frac{ER}{jwl} = \frac{ER}{X}$$

(X is equal to the capacitative or inductive reactance since they are both equal to each other in this case.)
The current through R is

$$I_R = \frac{ER}{XR} = \frac{E}{X}$$

Thus, this last equation shows that the current through R does not vary with a change in R. Thus, if lamps burn out, the current will not change.—G.W.D.

A. TO QUESTION 303—This type of constant-current transformer is known as a static type. It operates on the principle of a resonant network which consists of two condensive and two inductive reactors, each of which has equal reactance. In such a network, the secondary current is directly proportional to the primary voltage and is entirely independent of the load or impedance of the secondary circuit.

The series insulating transformer is just used to separate the network from the load.

This system has a high power factor

Wagner STEEL-FRAME Motors

Proved

by years of service!

quiet... dependable... trouble-free!

Since 1930, when Wagner started manufacturing steel-frame drip-proof motors, they have been *proved*—by years of hard usage in industry after industry.

Today this time-tested design is available in polyphase motors through 326 frame size. The motor frames are formed of heavy rolled steel, shaped to accurately center the stator core and to provide passages for adequate ventilation. An auxiliary fan draws in air through the openings in the front endplate, forces it through these passages and out through the endplate openings on the drive end. Heat is effectively carried off from all parts of the motor.

These motors are available with either sleeve or ball bearings. They are completely drip-proof when mounted in the normal horizontal position, and by rotating the endplates are still drip-proof in the sidewall or ceiling horizontal positions.

Bulletins give full information on the complete line of Wagner Motors. Twenty-nine branches, located in principal cities, are ready to assist you whenever you have a motor problem. In addition, almost 500 authorized motor repair shops provide speedy, nationwide service facilities.

Wagner Electric Corporation

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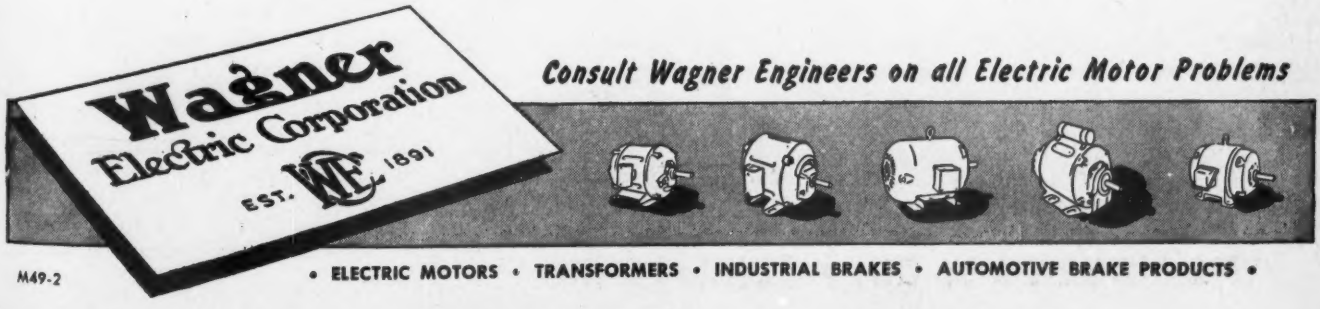
Consult Wagner Engineers on all Electric Motor Problems



M49-2

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but has a disadvantage that it does not compensate for variation in primary line voltage; and this in turn affects the secondary current (secondary current varies directly with primary voltage). Certain types of load set up harmonics, which also affects regulations. These types of loads are gaseous vapor lamps and open circuited series transformers.—I.J.L.

Grounding

QUESTION 304—In our plant we have a gutter enclosing busbars of about 1000 amp. capacity. Recently when I opened this gutter, there were a good many burned places on it. Probably 50 or 60 altogether. These burns were of varied intensity probably the largest would be about like a 100 amp. short of short duration. These burns were on all three bars at varied distances from each other and from the other busbars. (3 phase 220 volt). There were only three or four very lightly burned places in the gutter and these were on the cover, at least four times farther away than the bars are from the back of the gutter. A static discharge is unlikely as these bars are only 6 feet long and feed a good many motors, many of which are in poor condition. Due to the location of the plant, possibility of lightning is practically ruled out, and I am of the opinion that either of these would cause considerably more damage. Can a reader help me out as I am afraid more damage might result if it happens again?—C.M.

A. TO QUESTION 304—You do not mention what environment your busbar is in, so I can answer your question in a general way. There is a fairly powerful magnetic field set up around a bus of this size so it is very likely that a periodic accumulation of dust collects, and when a sufficient quantity is present, a momentary short circuit occurs which would produce the burns you describe. This is especially likely if there are any ferrous metal cuttings in the near vicinity. A sure remedy for this situation is to clean the bus at regular intervals with compressed air.—G.R.W.

A. TO QUESTION 304—The trouble is due to a combination of two factors, accumulation of dust and voltage surges. The dust may be slightly conductive and thus offers a sharp point from which arcing may be obtained.

WHAT—*no wires?*

That's about it when Electric Feedrail, the modern, totally enclosed, electrical distribution system is used.

One vertical cable connected to an overhead trolley, through an Ever-Lok trouble-proof connector—no wires to trip over, snag or tangle, no exposed circuits—and you can move the equipment along the line without disconnecting.

Feedrail is also ideal for cranes and hoists, moving test lines and lighting. In fact, anywhere electrical equipment moves. You can save wiring costs, maintenance time, speed up your plant, and make it electrically safe at the same time.

See what others are doing with Electric Feedrail. The new 32 page catalog, No. 20, with more than 100 illustrations and layouts and diagrams, and complete specification data, is yours for the asking. Write for yours now.

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Any Quantity
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OVER 300 types of Electric Motor Bearings are now available from stock . . . without delay. Each bearing is cast in a special high lead alloy, completely machined, ready for assembly and guaranteed to be equal to original equipment. Try Johnson Bearings once and you will use no other.

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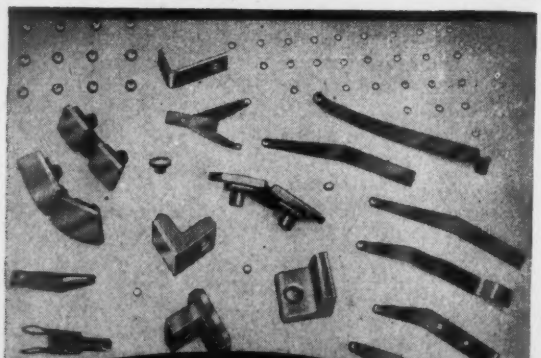

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"Since 1919" SUPERIOR CARBON BRUSHES

Surges on lines may cause extremely high momentary voltages. These surges are of brief duration but their magnitude may run to several times the applied voltage. The writer has in mind one occasion when trouble was reported in the test department of the shop with a batch of transformers failing under test. A check made with an oscilloscope showed that surges existed on the line that raised the momentary applied voltage to several times beyond the designed maximum stress.

What has undoubtedly occurred is the following: Surges have caused arcing at locations where dust has accumulated. Power current followed the initial arc, burnt away the dust and cleared the fault by itself. The duration of the fault may be too brief to cause either fuse or circuit breaker operation—hence the appearance of burnt spots but no reports of circuit failures.

For future, small capacitors of approximately .1 mfd. from each phase to ground will help as they will absorb the surge. They should be rated at least 1000 volts a-c to avoid breakdown.—H.H.S.

Voltages on Three Phase

QUESTION 305—During a recent discussion regarding voltages on a 3-phase, 4 wire system, we connected up three single phase, 1 kva. 120/120 volt transformers in Y-Y. The primary voltages were exactly alike and did not change. In the ground from neutral of the secondary we connected a knife switch. When the switch in this circuit was opened, the voltages between phases were greatly different, but when it was closed the voltages immediately equalized themselves. There was no load on the secondary. Will someone please explain this?—L.W.K.

A. TO QUESTION 305—It is evident in this case that third harmonic voltages exist in the secondary windings of the transformers. These harmonic voltages and some of its multiples are usually present in the secondaries of transformers and are usually nullified by proper connection of the transformer bank.

In a Y-Y connection without a neutral, the harmonics add up and cause unbalanced voltages in the secondary. With a neutral connection the harmonic voltages cause a harmonic current to flow in the neutral and the secondary voltages remain balanced.—J.C.

Install E. M. T. Faster and Neater with BRIEGEL Thin-Wall Fittings

NEATER • FASTER • STRONGER • APPROVED

All B-M Fittings Carry the Underwriters' Seal of Approval

FOR faster, neater and stronger thin wall conduit connections insist on either Briegel Indenter or Briegel Twiston Self-threading type all steel, one piece connectors and couplings.

B-M Indenter fittings, the only approved couplings and connectors of this type, have long enjoyed wider use and application than any other method of installing E.M.T.

The new B-M Twiston Self-threading fittings now make it possible to have threaded, raintight E.M.T. connections without the use of dies. Two complete turns with a pair of pliers threads the tubing and screws the fittings into a locked position, which results in the strongest connection possible and one that will withstand severe vibration.

What ever the thin wall job might be, you will find that you can do it neater, faster and better with Briegel UL Approved E.M.T. fittings.

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Silicone News

DC SILICONES

Silicone Insulation Gives Rapidly Reversing Motor 10 Times Normal Life

That's significant news to designers of machine tools. Even more significant perhaps to electrical engineers is the further confirmation of our laboratory and motor test results. These tests indicated that Silicone Insulation has 10 times the life and 10 times the wet insulation resistance of Class 'B' insulation under comparable conditions.

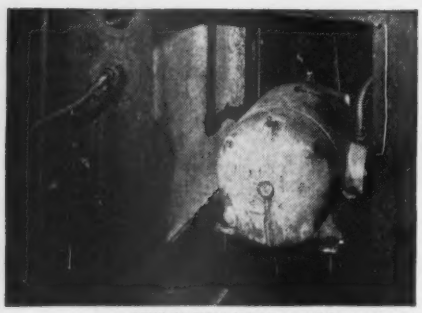

PHOTO COURTESY COGSDILL TWIST DRILL COMPANY

Improved drill grinder depends upon DC Silicone Insulation for long trouble-free operation.

Engineers at Cogsdill Twist Drill Company of Detroit developed a unique machine for grinding drills. Instead of reversing the carriage by a conventional cam or crank, they use a 1 h.p., 1200 r.p.m. motor to reverse the carriage drive 50-60 times per minute.

In this service, Class 'A' insulated motors lasted 3 to 4 days; Class 'B' insulated motors lasted 3 to 5 weeks. After repeated failures, the reversing motors were rewound with DC Silicone Insulation by the A. H. Nimmo Electric Company of Detroit.

The motor bearings were packed with DC 44 Silicone Grease and the frame was painted with DC Silicone enamel. The motors have now been in service over 10 months and show no sign of failure. A hazardous smoke problem caused by the burning of conventional finishes also has been eliminated.

This is a typical example of how Dow Corning Silicone Insulation increases the life and reliability of hard working motors. Specifications for rewinding ac motors are given in data sheet G6K.

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Dow Corning
FIRST IN SILICONES

A. TO QUESTION 305—A Y-Y connected system may be used for step up transformation. It should, however, never be used for obtaining a three phase four wire system because of the *floating neutral* on the secondary, thus resulting in a high degree of unbalance of the secondary voltage.—J.E.

A. TO QUESTION 305—The low resistance ground cuts out the effect of the high resistance ground which you will find on one or more transformer secondaries. A potentiometer will indicate the section of the grounded winding.—H.S.

Can you ANSWER these QUESTIONS

QUESTION G14—What could be the cause for blowing 35 amp. fuses (fusetrons) on a 7½ hp. motor operating a blower on an automatic boiler? All equipment is new.

During the week, with the plant in operation and voltage at 200, the fuses will not blow.

However, on weekends, with plant idle and voltage at approximately 250, the fuses will blow.—D.A.C.

QUESTION H14—Could someone suggest what to do in order that a grounded phase would register by means of a light or signal placed at our various substations?

Our power supply is 440 volts, 3 phase and the transformers are connected delta with no ground connection.

Each substation has from four to six feeders, but it would not be necessary to indicate on which feeder the ground has occurred.—F.F.

QUESTION J14—On a condenser winding machine there is one motor used which operates at 1800 rpm. normally, at 440 volts and 60 cycles. Now when terminals are to be inserted into the condenser a mechanical device causes an electrical contactor to remove the 440 volts, 60 cycles from across the motor and then applies 110 volts, 120 cycles to the motor which slows down the motor to a few rpm. How do you account for the 120 cycles producing such slow speed when the poles of the windings are the same under both conditions?—E.J.K.

PLEASE SEND IN YOUR ANSWERS BY FEBRUARY 15

To be Sure of Proper 3-Phase Connections, get the Reliable

KNOPP Phase Sequence Indicator

- *Nothing to Adjust—Positive Readings*
- *Used for 20 years the nation over*

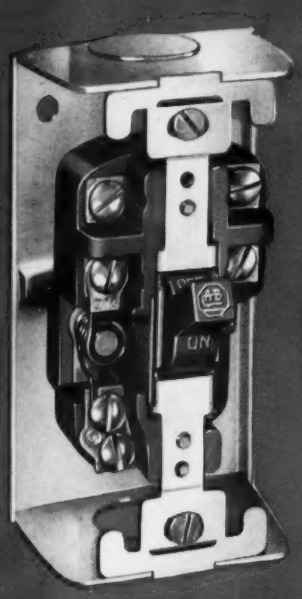
All over the U. S. men-in-the-know prefer the Knopp Phase Sequence Indicator. It saves time.

Just clip it on, push the safety button and determine beyond a doubt whether the phase sequence is A-B-C; or C-B-A. This positive Knopp Phase Sequence Indicator has nothing for you to change or adjust for readings. No misleading lamps or dials. It does protect equipment and assure properly connected polyphase wiring; 50 to 500 volts, 3 phase, 3 wire, 25-60 cycles.

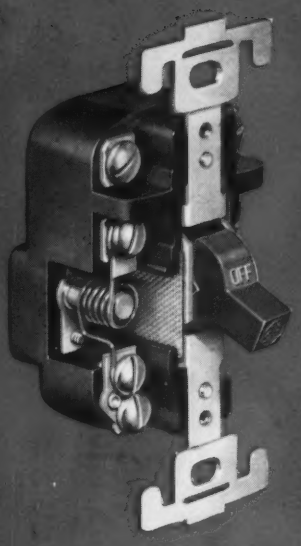
Well-Built, Foolproof

It stands up under rough field use and gives accurate and reliable service. It is made by Electrical Facilities Inc., technical electric equipment manufacturers of 21 years experience. *This* indicator has a *laminated* bakelite housing and no exposed metal parts. It is built for *complete* safety. Fully insulated clips can remain attached between tests as safety push button permits indication only when needed. Weighing but 21 oz., the Knopp Phase Sequence Indicator is small and easy to carry. Price $25; with leather carrying case, $30. Order today or write for complete description.

ELECTRICAL FACILITIES INC.
4232 Holden St. Oakland 8, Calif.

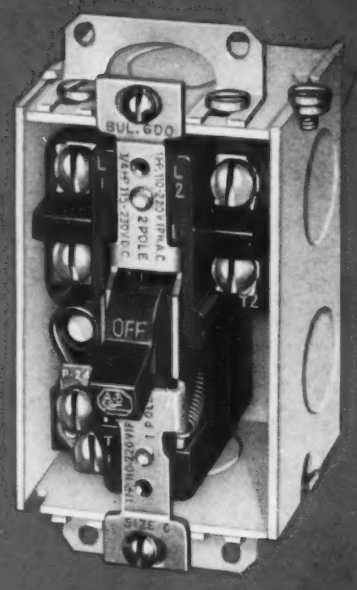


Open view of enclosure for surface mounting.



Switch unit without enclosure for machine bases.

Closed view of enclosure for surface mounting.



Bulletin 600 Switch fits into any standard switch box.

Starting Switches with Overload Protection for Fractional Horsepower Motors

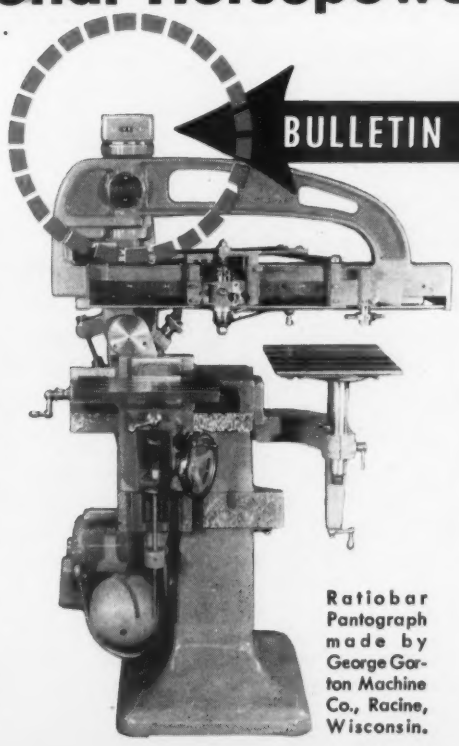
BULLETIN 600 STARTING SWITCH

To satisfy the latest ruling of the National Electrical Code... which requires overload protection for many fractional horsepower motor applications... the Bulletin 600 Starting Switch is the popular answer.

Its self-contained thermal breaker is always dependable. Long periods of inactivity will not affect its accuracy. At the first sustained overload... the switch trips... and the motor is protected against burnout.

Waterproof Enclosure.

The Bulletin 600 Starting Switch cannot be held closed until the overload condition is corrected. This compact control unit is a sales asset to any machine.



Ratiobar Pantograph made by George Gorton Machine Co., Racine, Wisconsin.

Above is shown how easily the Bulletin 600 Fractional Horsepower Starting Switch fits into the standard Allen-Bradley enclosure or into any standard switch box.

The switch unit can also be mounted in any suitable cavity in the machine frame.

For locations requiring enclosures to operate in wet or hazardous locations, there are several standard A-B enclosures to meet every service requirement.

Bulletin 600 Switches are available with pilot lights, selector switches, and other accessories. Send for complete data, today.

ALLEN-BRADLEY

QUALITY

BULLETIN 600 STARTING SWITCHES

A-B Quality

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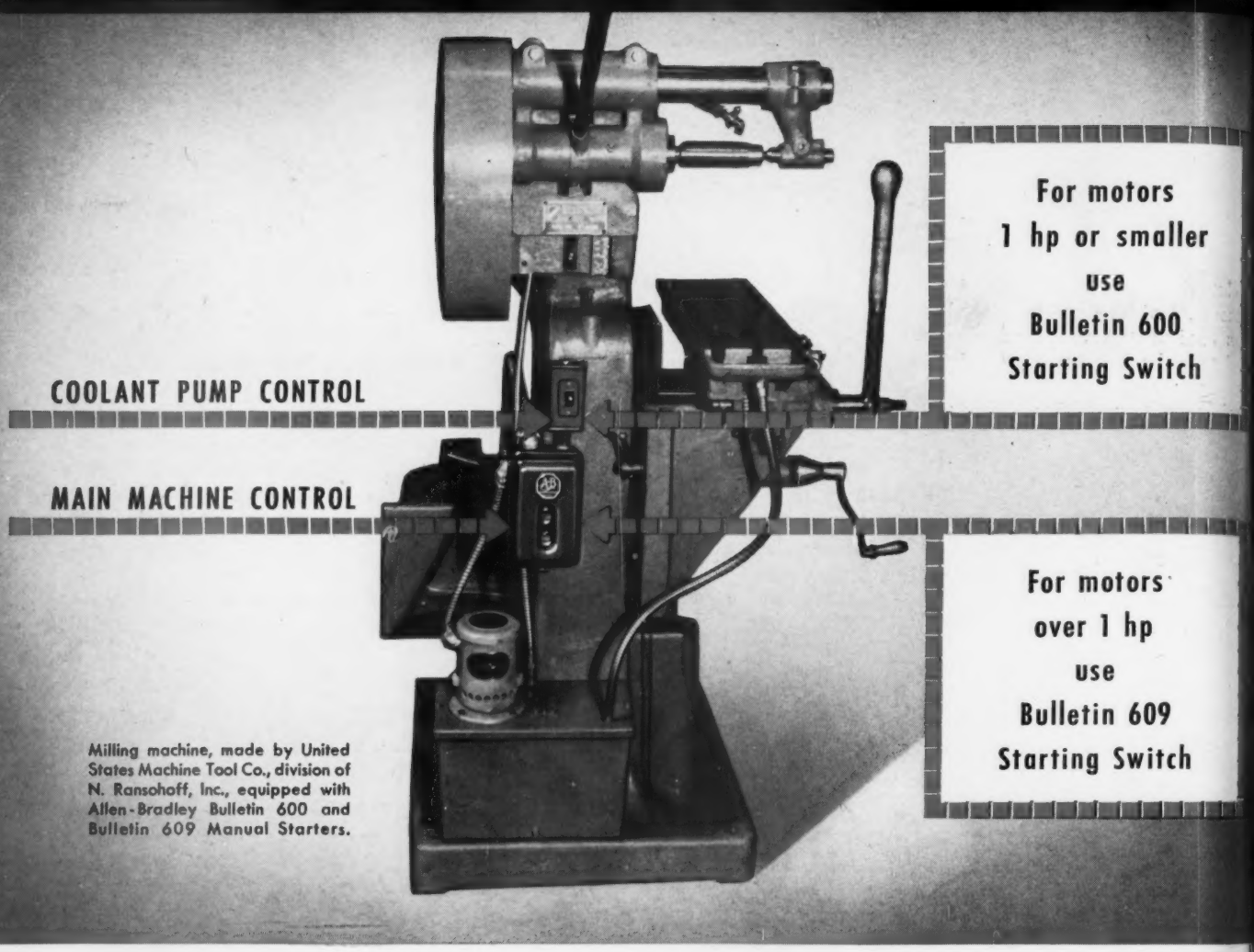

COOLANT PUMP CONTROL
MAIN MACHINE CONTROL
For motors 1 hp or smaller use Bulletin 600 Starting Switch
For motors over 1 hp use Bulletin 609 Starting Switch

Milling machine, made by United States Machine Tool Co., division of N. Ransohoff, Inc., equipped with Allen-Bradley Bulletin 600 and Bulletin 609 Manual Starters.

How to Pick the Right Manual Starter

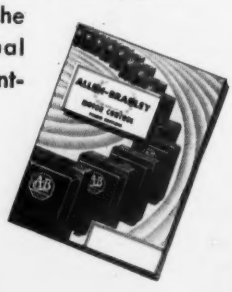
For Motors of 1 hp or less—Specify the compact Allen-Bradley Bulletin 600 Manual Starting Switch. It is so small that it fits easily into any standard conduit switch box . . . with ample wiring space.

A self-contained thermal overload breaker trips the switch when the motor is overloaded. The switch cannot be reclosed until the overload condition is corrected. A full line of enclosures is available for every service application.

Bulletin 609 Starter in steel enclosure. Note white interior and the ample wiring space.

For Motors of 1-5 hp, 220 v—1-7½ hp, 600 v Specify the popular Allen-Bradley Bulletin 609 Manual Starter, available in enclosures for general, waterproof, dust-tight, and hazardous locations.

Quick-make and quick-break silver alloy contacts . . . double overload breakers . . . and handy push-button operation are a few of the assets of this popular manual starter. Available also for mounting in machine bases.



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Fire Underwriters Inspection Bureau
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Questions on the Code

Class II (Dusty) Locations

Q. *I have an installation to make of two small sifters to be used for various materials, the worst of which appears to be powdered sulphur. The one unit has a 230 volt explosion-proof vibrator; the other a ¾ hp., 440 volt, 3 phase totally enclosed motor (no Underwriters' Approval tag). They will be located in an enclosed unventilated room, and appear to be pretty well constructed to confine the dust to the units. However, I would consider these units to require Class II wiring—including an approved motor for one unit. It is not clear to me what is required in the way of conduit fittings. Section 5054a 1 states "fittings and boxes shall be dust-tight." Would ordinary condulets with gaskets of a suitable material under the cover be satisfactory, or are explosion-proof (Class II) condulets definitely required? Under Section 5054a 2 the code apparently approves flexible metal conduit for flexible connections. Is this the common flexible conduit designated "Greenfield"? It seems to me that this equipment is inconsistent with Class II equipment, particularly at connectors.*

Am I right in not installing seals on either side of a Class II starter or switch per Section 5055?

If there is a 10 ft. horizontal run or a 5 ft. vertical run extending down from the dust-tight enclosure, a sealing fitting is not required.—W.E.T.

A. A totally-enclosed motor as mentioned in Rules 5058a and 5058b would meet the requirements for either Class II, Divisions 1 or 2 locations.

Ordinary condulets not being of the dust-tight construction would not be suitable for dusty locations. Dust-tight construction is different from ordinary construction.

The flexible metal conduit mentioned in Sections 5054a 2 for use in Class II locations where flexible connections are necessary, is the common flexible metal conduit sometimes known as "Greenfield". Note that this is different from the flexible connection used in Class I locations and specified in 5014a.

If there is a 10 ft. horizontal run or a 5 ft. vertical run of conduit extending down from the dust-tight enclosure, a sealing fitting is not required as stated in Section 5055.—F.N.M.S.

Show Case Lighting

Q. *While inspecting a new filling station I noticed a glass display case being uncrated and upon inquiring, I found they intended to place these cases on the pump islands between the pumps. Upon examination, I found the case to be wired in thin wall tubing with fluorescent tubes above each glass shelf. I explained to the owner that they could not safely use these cases on the islands unless they removed the wiring from them, and he immediately wanted to know how they might be lighted and still comply with the Code. Can you help me on this?*—R.O.C.

A. Section 5142 of the N. E. Code states that all wiring within five feet of the grade must be of the type suitable for use in a Class I Group D Division 2 location. Therefore such a display case cannot be lighted by ordinary fixtures located within five feet of grade level. It is hardly practical to use explosion-proof fixtures, so the case can either be lighted from spot lighting fixtures mounted on nearby lighting poles or standards, or if the case is sufficiently high to permit the location of ordinary fixtures within the top of the cabinet and still have them five feet or more above the grade level, they might prove more suitable. While there are no regulations governing such show cases, it would no doubt be advisable to separate the display portion of the cabinet from that part housing the lighting fixtures by a sheet of glass, and both sections should be provided with ventilation.—G.R.

Receptacles

Q. *We have been asked to install a number of receptacles in the floors of several display windows in one of the stores here and there is some question about the type of receptacle that must be used in the floor of a display window. Will the Code allow the use of an ordinary receptacle or must it be of the regular watertight type suitable for use in floors?*—H.M.B.

A. The N. E. Code under Section 4162 gives permission to use ordinary receptacles in the floors of show windows and other similar locations providing such floors are elevated above the regular floor of the building and are so used that they are likely to be free of mechanical injury, moisture and dirt.—G.R.

Theatre Wiring

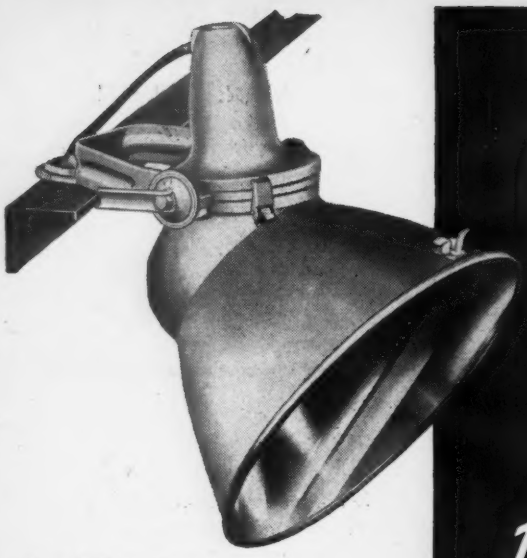
Q. *Is it possible to wire the display frames in the lobby of a theatre with armored cable and the circuit run through the basement of the theatre from the manager's office, all in armored cable?*—N.M.C.

A. If the auditorium of the theatre has a seating capacity of over 100 persons, the answer is "NO".

If the seating capacity of the theatre is 100 persons or less, the theatre may be wired with armored cable.—F.N.M.S.

Protection of Conductors

Q. *We have used quite a bit of underground cable this past year for services and have followed the practice of using thin wall conduit for protection of this cable on the pole and outside building walls extending the tubing only a few inches below the surface of the ground. Recently one of*



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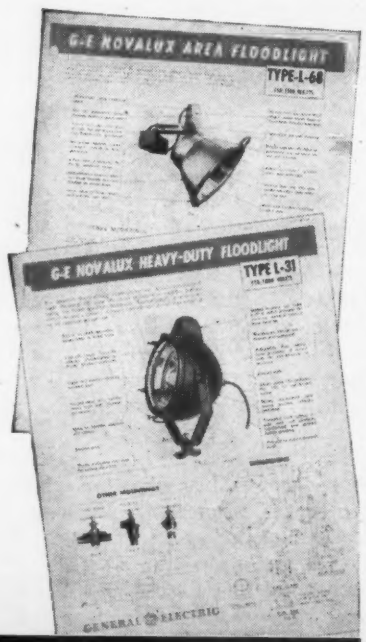


GENERAL ELECTRIC

the inspectors refused to accept a job where it was necessary to use more than a single length of tubing because the coupling used was not of the watertight type. Does the Code back him up when tubing is used solely for mechanical protection?—W.B.G.

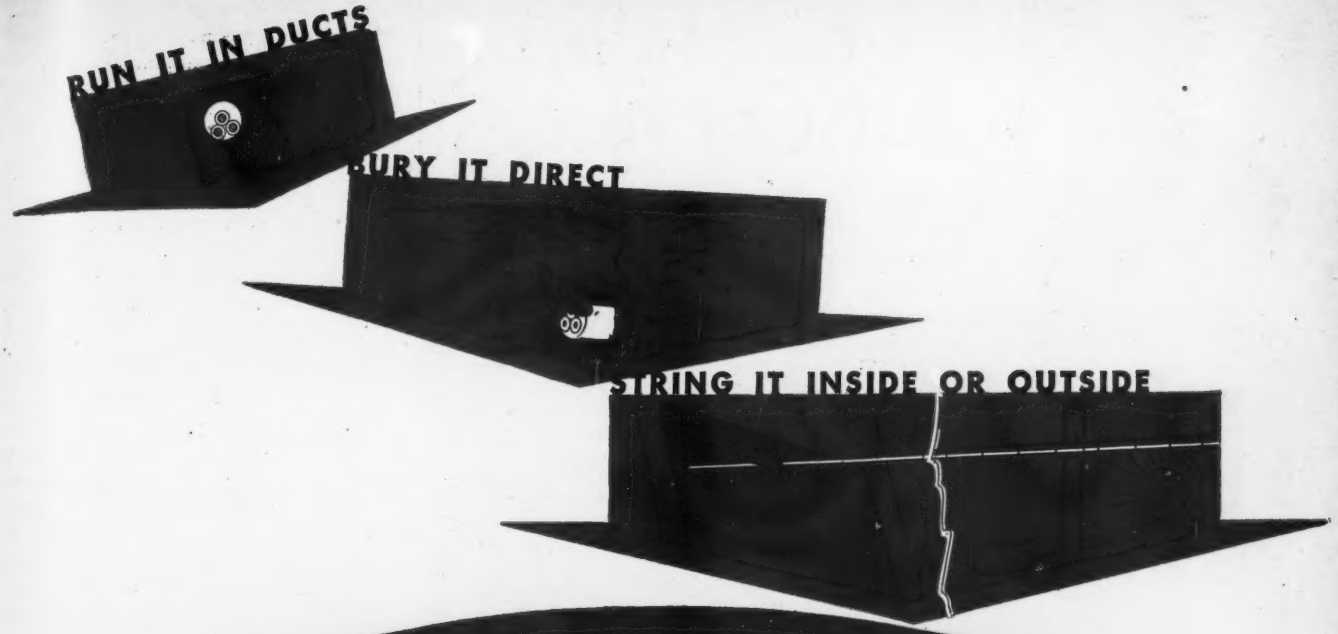
A. If the electrical metallic tubing is arranged to drain, there is no need for watertight fittings as the USE type conductors will not be affected by moisture. However, in freezing weather the formation of ice in protective tubing might seriously injure the conductors.

This is not fully covered in the N. E. Code as Section 2332, which requires mechanical protection of such conductors to a height of at least eight feet above the ground, and further provides that conduit, electrical metallic tubing or other approved means be used for supplying such protection, does not adequately cover the subject. No reference is made to Articles 346 or 348 covering method of installation. However, in areas subject to freezing temperatures, it could be considered poor workmanship to make an installation which might fill with water. It therefore is considered good practice to terminate the upper end of the conduit or tubing with a bushing or pothead and if the bushing is used, water should be kept out by using a sealing compound. Obviously after sealing the upper end, it would be unwise to use a coupling which was not watertight somewhere below.—G. R.

Portable Tools

Q. *In an attempt to make the use of portable tools safer, I have obtained several one to one transformers and have instructed each crew to use them. These transformers are of two coil type with a barrier between the coils, so a fault from the primary to the secondary is almost impossible. I had reasoned that the isolated secondary could not short to ground and that a workman would have to contact both conductors in order to be in the circuit. This was done at considerable expense after years of trying to convince my men the third wire should be grounded on conventional equipment. Now the inspector tells me I have to ground the tools anyway even though the supply is isolated. Is that part of the National Code?—J.N.A.*

A. Section 2545-c of the N. E. Code requires the grounding of portable appliances or tools used by persons standing on the ground or on grounded surfaces. The paragraph reads as follows: "In other than resi-



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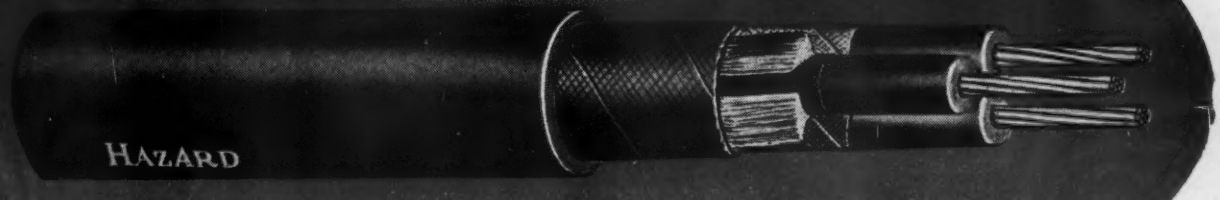

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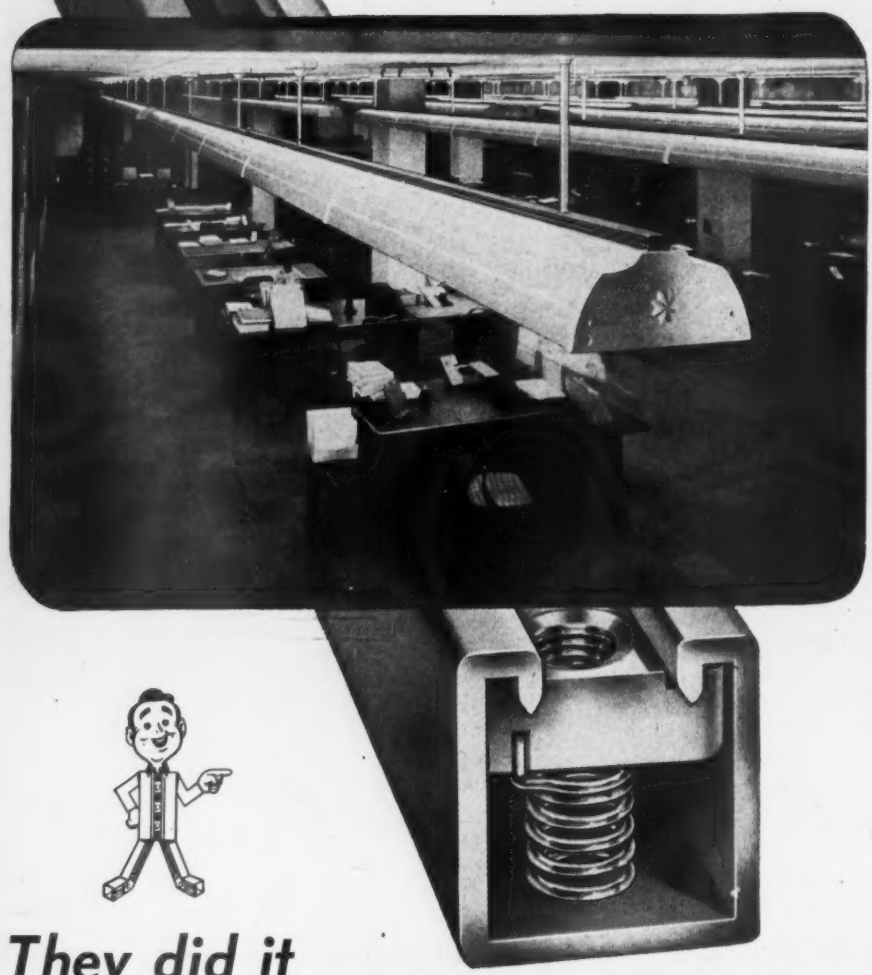

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dential occupancies, exposed metal parts of portable appliances used in damp or wet locations or by persons standing on the ground or on metal floors or working inside of metal tanks or boilers shall be grounded except where supplied through an insulating transformer with ungrounded secondary of not over 50 volts." Therefore because you are using secondary current of more than 50 volts for the operation of your portable tools, the Code requires that a grounding conductor be used.—G.R.

Motor Disconnect

Q. *Does a lock out stop-start pushbutton within sight and less than 50 feet from a motor whose combination starter and disconnect is on another floor or more than 50 feet away, eliminate the use of an externally operated disconnect switch at the motor?—M.D.D.*

A. Yes, it eliminates the necessity of installing a disconnect switch at the motor location, but it does not eliminate the necessity of locating a disconnect switch ahead of the controller.

The disconnect switch must disconnect both the controller and the motor from all ungrounded conductors, and for motors of over two horsepower and 50 horsepower or less, must be rated in horsepower.—F.N.M.S.

Junction Boxes

Q. *There has been considerable controversy between the inspectors and the contractors in regard to the accessibility of outlet and junction boxes used in connection with fluorescent fixtures, especially those mounted in continuous rows in recessed space. I have contended that whenever continuous strip fluorescent fixtures are installed directly over the outlet boxes, those boxes are no longer accessible as the grillwork set flush with the ceiling is part of the building finish. I therefore am trying to make the contractors install junction boxes flush with the building finish in some inconspicuous place where they would not be unsightly. Am I right in trying to enforce this ruling or is it contrary to section 3717?—L.S.*

A. The only section of the N .E. Code that requires that junction boxes be located to one side of a fixture is Section 4179 and that con-

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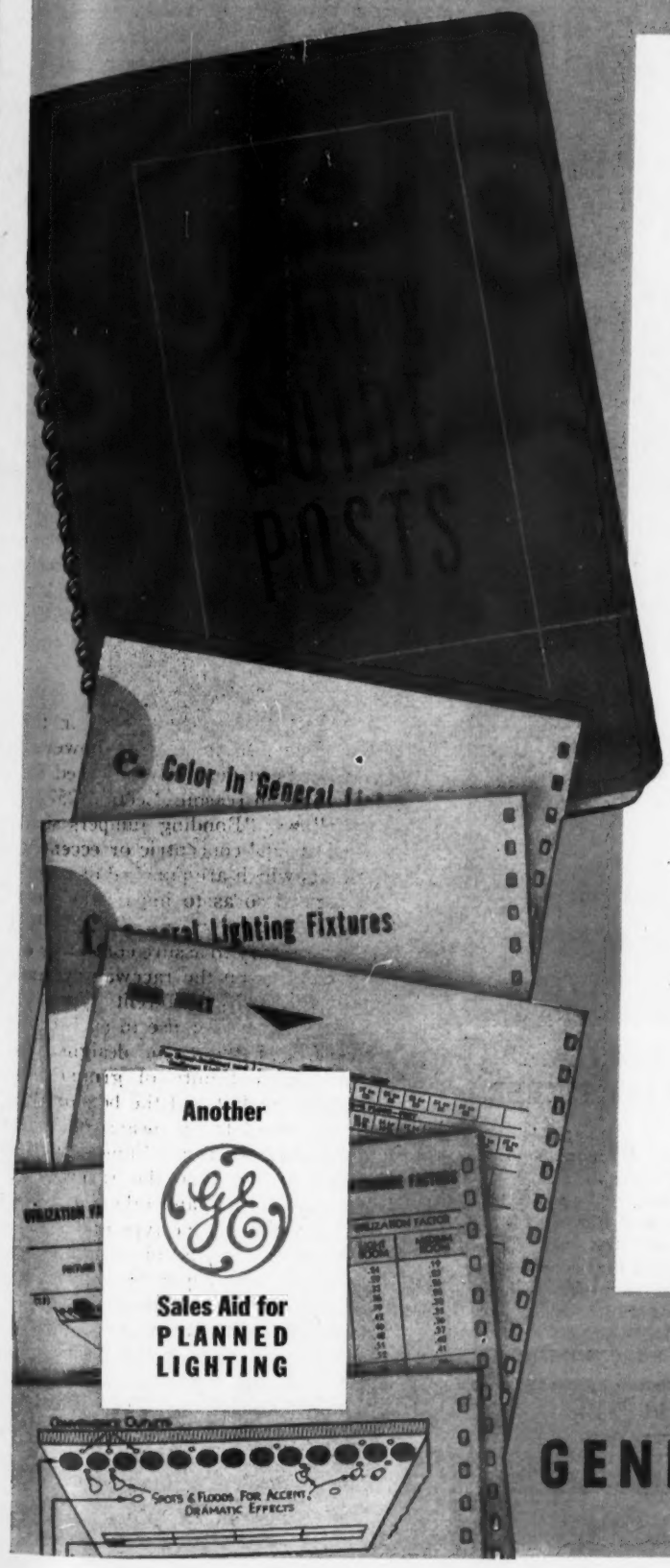

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cerns temperature. Therefore if the temperatures involved are not in excess of 140°F the Code does not prohibit even a recessed fixture from being mounted over the junction or outlet box. Where temperatures are excessive, you would be correct in requiring separation as Section 4179 reads as follows: "Conductors having insulation suitable for the temperature encountered shall be used. Where conductor temperatures are in excess of 60° C or 140° F, conductors shall be brought through at least four feet of metal raceway from the fixture to an outlet box at least one foot from the fixture. Such conductors, unless approved for the purpose, shall not extend a distance of more than six feet from the fixture as measured along the raceway."—G.R.

Bonding Jumpers

Q. *I was advised that from now on I will have to use a bonding jumper, whatever that is, every time I end a conduit or thin wall run in a box or cabinet that has knockouts capable of handling a larger conduit than is used. I have done considerable wiring-in many different cities and I have never heard of such a rule before. Is such a rule actually in the Code? —M.P.*

A. Yes, this rule has been in the Code for some time, however, it has not been generally enforced for some unknown reason. Section 2572-d is as follows: "Bonding jumpers shall be used around concentric or eccentric knockouts which are punched or otherwise formed so as to impair the electrical connection to ground." This rule is necessary to assure continuity of the grounding on the raceway system. There are many different types of bonding jumpers for use in such cabinets. All of them are designed to permit the continuity of ground between the conduit and the box or two or more conduits by means of short lengths of conductors. Some must be installed at the time the raceway is being put in place and others may be added any time. One type quite commonly used consists of a horseshoe shaped clip which may be slipped between the cabinet and the conduit bushing and has two cap screws, one of which is used to lock the bushing in place and the other to attach the grounding conductor. These bonding jumpers are required on all jobs using either conduit or electrical metallic tubing regardless of the type of occupancy of the containing building.—G.R.

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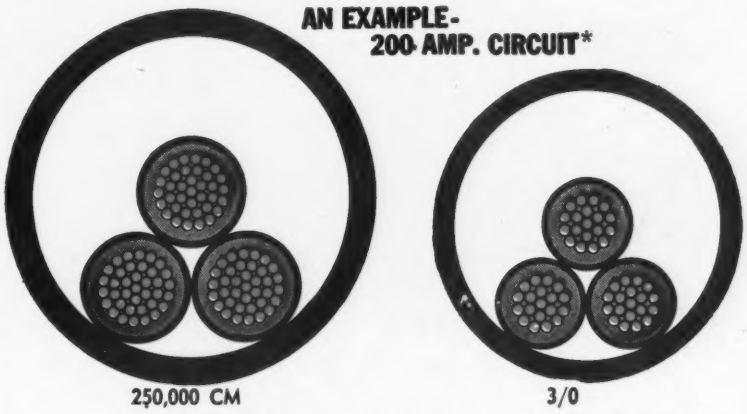

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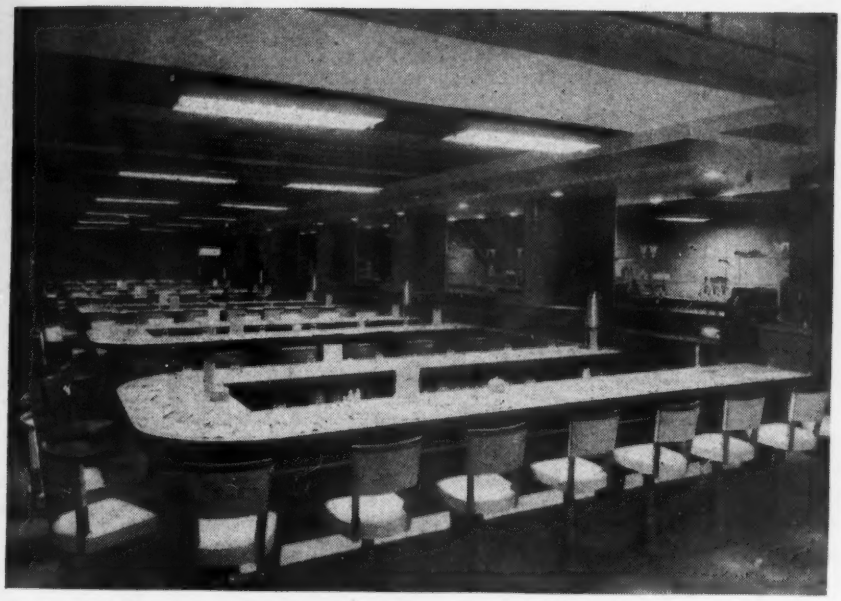

Louvered fluorescent fixtures are mounted above U-shaped counters in the new Meridian Lunch Bar, while incandescent down lights highlight service counters and cash registers.

Average intensities of 40 footcandles are obtained over escalators and in adjacent sales areas by using 40-watt two-lamp Miller troffers beneath moving stairways and recessed into ceilings.

Modern lighting and a new escalator system from the main to the fifth floor have given a New Look to the Forbes and Wallace department store in Springfield, Mass. To customers, the resulting effect is an indication of progressive merchandising. To designers, the installations represent the successful solution of numerous construction problems, for design was affected by sloping ceiling levels, irregular wall heights and structural obstructions in the form of beams, air ducts and utility piping. Lighting units are standard commercial assemblies selected in conformity with illumination requirements and structural limitations. The result is entirely satisfactory in spite of the structural limitations which existed.

In the new Meridian Lunch Bar, four-lamp 40-watt louvered-bottom suspended units are pendant-mounted between runs of air ducts to illuminate the counter tops and leather-covered swivel chairs in this eating area. Recessed incandescent down lights highlight service counters and cash registers. This area, designed by Raymond Loewy Associates, is completely air conditioned and utilizes the popular U-shaped rapid-service counter pattern.

In the main merchandising area, the installation of escalators created the problem of providing adequate illumination on the moving stairways while providing proper quality of light for display and sales in adjacent areas. Recessed Miller fluorescent troffers equipped with Polystyrene lenses for diffusing the emitted light are installed in the slanting under-sides of escalators and in ceilings adjacent to the moving stairways. Mounting heights and spacings were necessarily dependent upon structural elements of the escalator wells and lighting intensities naturally fluctuate with changing installation details. However, an average of 40 footcandles is provided by these fixtures which are installed continuously in groups and individually, as space dictates. Troffers are two-lamp units, designed by Mr. Lawrence of Forbes and Wallace in conjunction with A. N. Martinson of the Miller Company. Electrical installation work was by the Star Electrical Company, Springfield.

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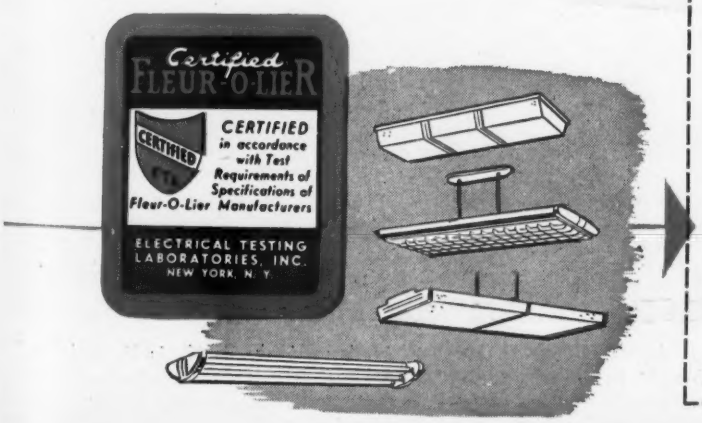

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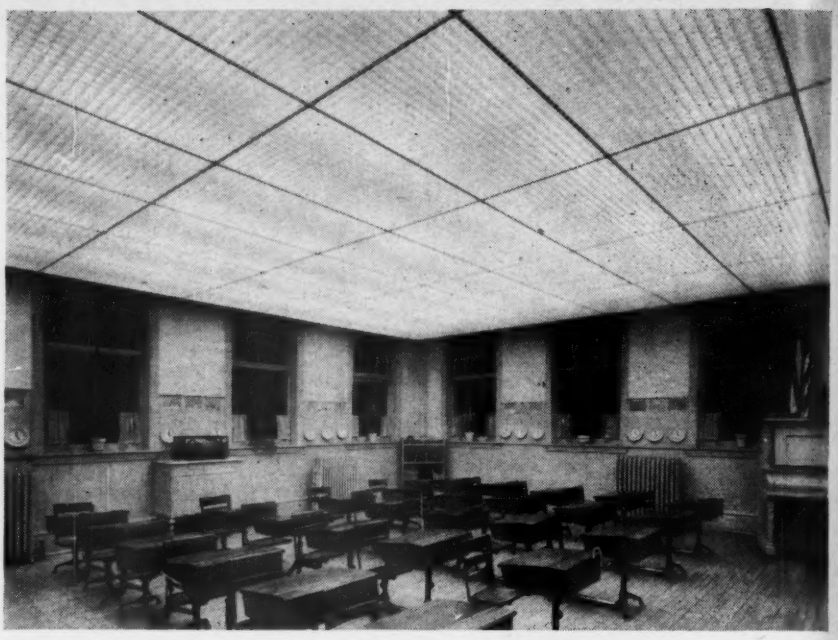


Translucent louverall ceiling lighting installation in class room of Central School, Des Plaines, Illinois, provides 116 footcandles with maximum ceiling brightness of .75 candles per square inch.

Louverall Ceiling In School Room

A translucent, or plastic, louverall lighting system has been installed in the Central School, Des Plaines, Ill., to provide high intensity illumination with low brightness louvers.

The classroom is 31 ft. 9 in. long, 25 ft. wide, with a 12 ft. high ceiling. The louverall ceiling was installed with the bottom of the louvers 9 ft. 9 in. from the floor, suspended 3 ft. 3 in. from the ceiling above. The suspended louverall ceiling consists of 48 sections of Benjamin "Sky-Glo" plastic Vinylite panels, each 3 ft. by 5 ft., formed by eight rows of six panels per row. Two basic louver sections fit into each 3 ft. by 5 ft. panel, and rest on the steel channel supporting frames.

Over each ceiling panel is installed a 2/40-watt industrial open end type porcelain enameled steel reflector, with the bottom edge of the reflector 18 inches above the top side of the louvers. A total of 48 reflectors and 96-40 watt 4500 degree white fluorescent lamps are thus used to light the room. This gives a total of 5.8 watts per square foot and 255 lumens per square foot.

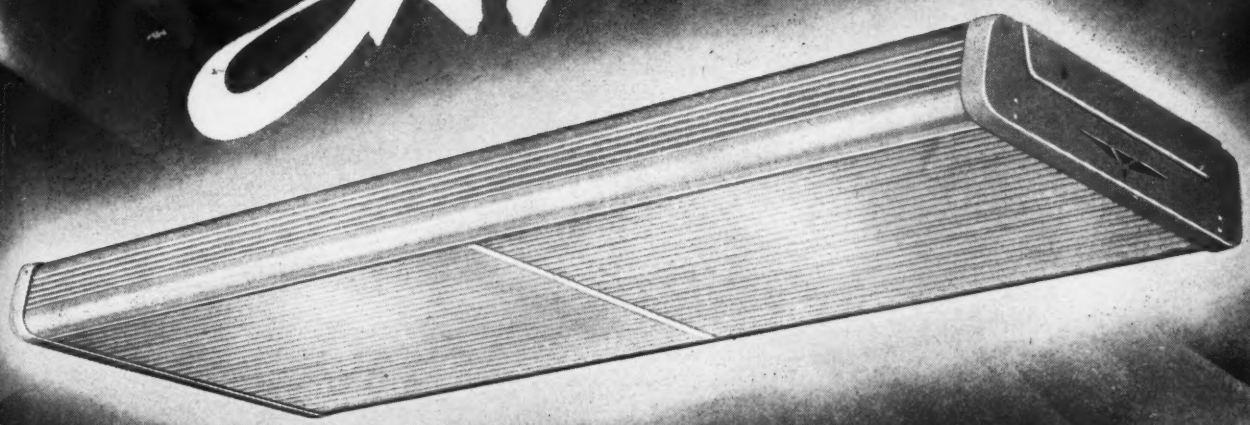
Average room illumination was measured 30 inches above the floor and found to be 116 footcandles. Illumination level on desk tops was also measured, with the surrounding desks occupied, and found to average 103 footcandles. The maximum louver brightness was .75 candles per sq. in.

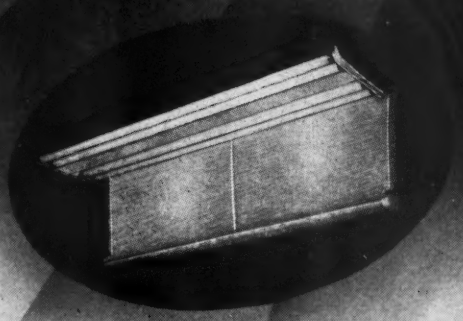
Under the above conditions the coefficient of utilization is .45, and provides 20 footcandles per watt per square foot.

The used-car lot of Robert D. Maxwell in San Diego, Calif., is lighted by 16 Goodrich No.-90 floodlights spaced at 40-foot intervals and containing 1500-watt lamps 24-feet above ground. A year after installation, intensities beneath floodlights were 20-fcs. and 15-fcs. in the center of the 50-by-200-foot lot.

Another addition to Electro famous
BASIC UNIT SERIES—the BASIC UNIT
principle that meets ALL commercial
requirements AND cuts your inventory in half.

SKY-RAY





No. 1046—4-lt 40 watt (1040 Basic+Kit No. 6)
No. 1026—2-lt 40 watt (1020 Basic+Kit No. 26)

- Another outstanding Electro achievement brings you a new, wafer-thin, extremely shallow type glass and plastic luminaire. Bottom panels of ribbed diffusing glass provides maximum light transmission without glare and with low surface brightness.
- Ribbed glass panels are held in metal, basket-like, hinged frame permitting exceptionally low cost maintenance. Readily removable for easy cleaning, as illustrated.
- Convenient shaped side panels are gracefully fashioned of sturdy ribbed plastic, that holds its shape.
- Available in 4-lamp 40 watt and 2-lamp 40 watt. Surface or Pendant mounted.
- All models may be used for *Individual* or *Continuous* row installation without the addition of extra parts.

BE "BASIC" IN '49

Sold by leading Electrical Wholesalers everywhere

ELECTRO'S LIGHTING ENGINEERS ARE ALWAYS AT YOUR SERVICE

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ROYAL

ROYAL ELECTRIC CO., Inc.
PAWTUCKET, RHODE ISLAND

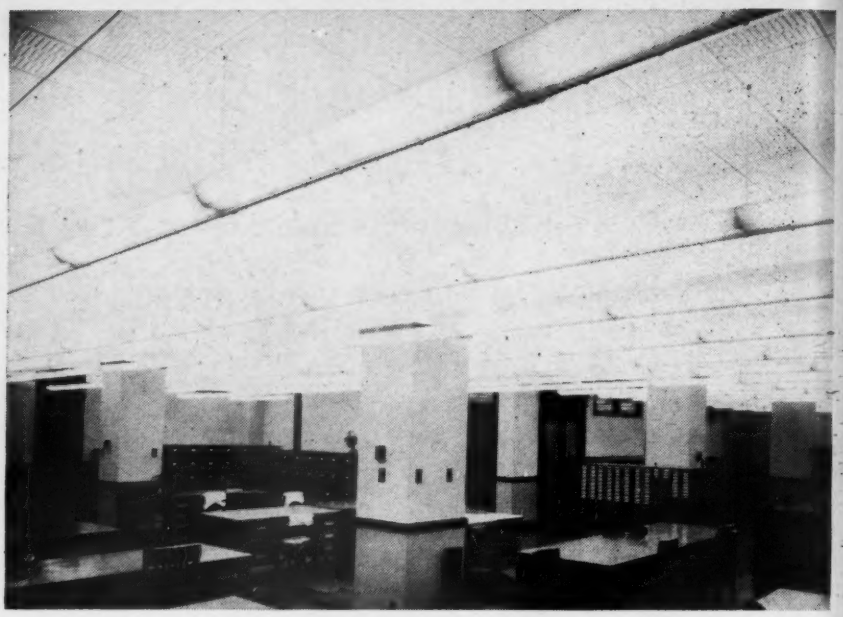


FIG. 1—Balanced brightness feature the shadowless illumination in the engineering department of Public Service Company of Northern Illinois, Joliet, Ill.

Balanced Brightness Office Lighting

The Public Service Company of Northern Illinois at Joliet has installed luminous indirect lighting in their engineering department to provide shadowless illumination with balanced brightness ratios. The result is the elimination of direct and reflected glare, and good conditions for prolonged critical seeing.

The office area involved (Fig. 1) contains approximately 3000 square feet. The ceiling height is 11 feet. The ceiling is acoustical tile, and is painted flat white, providing a reflection factor of 76 percent. Wall surfaces are light green painted plaster, with reflection factor of 60 percent, and dado is a darker green shade with 40 percent reflection factor. The floor is light varnished hardwood, with reflection factors of 20 percent, while the office furniture and wood trim is miscellaneous, with rather dark finishes, averaging about 10 percent reflection factor.

The seeing tasks involved include general office work, transcribing, tabulation, drafting, reading field sketches and notes, and blue prints.

In planning the lighting for this office, W. S. E. Miller, company illuminating engineer, selected a sustained 65 footcandle intensity on the desks as a practical intensity. He recognized that some recommended practices for engineering and drafting room work call for higher values of illumination, but also recognized that such recommendations are based on average lighting equipment. He decided that somewhat lower intensities would be equally effective if the lighting equipment and reflection factors of ceilings and side walls were selected to provide a balanced brightness condition. This decision was based on the fact that the eye functions more efficiently and with less fatigue in a uniform luminous surround.

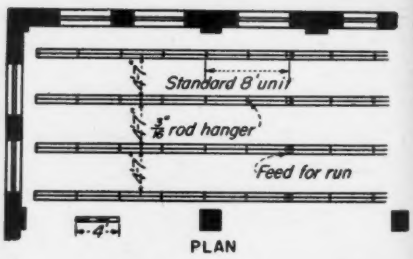


FIG. 2—Plan of typical bay showing arrangement of continuous rows of Ainsworth Spatialite fluorescent equipment.

Ainsworth Spatialite luminous indirect continuous row pendant luminaires were selected for this lighting problem. The continuous rows were spaced 4 ft. 7 in. on centers (Fig. 2), and suspended 16 inches from ceiling to top of units. With this arrangement the brightness of the luminous reflector and the ceiling are almost equal, blending into a total luminosity with no distracting element.

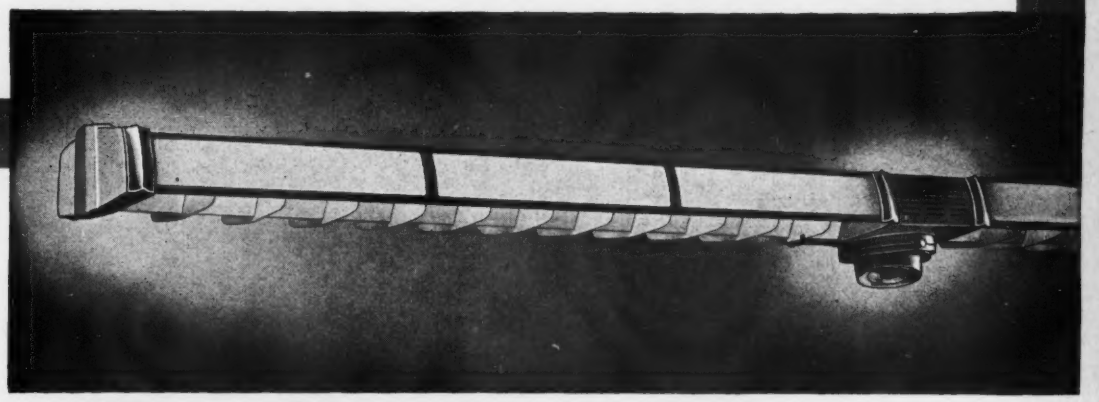
The layout used results in a total load of 5.5 watts per square foot. Illumination levels after 100 hours averaged 85 footcandles, and after eight months of operation with very little maintenance averaged 70 footcandles. This is a maintained intensity of 12.7 fcs. per watt per square foot.

De Franco Electric Company of Joliet, Ill., were the electrical contractors, and Hawkins Electric Company of Chicago, electrical wholesalers, furnished the lighting equipment.

These are the Wakefield "Grenadier Spots"

for double-duty store lighting!...

In any installation where "spot" lighting and general lighting are desirable, you can recommend the Wakefield Grenadier "Spots" to do the double job with complete confidence. To all the proved advantages of the regular Grenadier has been added the plus advantage of an excellently designed spotlight assembly. Wakefield Grenadiers are finely engineered louvered units with translucent white plastic side panels. All metal parts are beautifully finished in soft metallic satin. For complete details on Grenadiers and the entire Wakefield line, you should have our fully illustrated, factually written, 36-page catalog. Write for your copy today.



THE GRENADIER II "SPOT"

Takes two 40W fluorescent lamps in each 4′ section. Each 4′ section has a single adjustable "spot" taking a 150W Sealed-Beam lamp.

THE GRENADIER IV "SPOT"

Takes four 40 W fluorescent lamps in each 4′ section. Each 4′ section has two adjustable "spots", each taking a 150 W Sealed-Beam lamp.

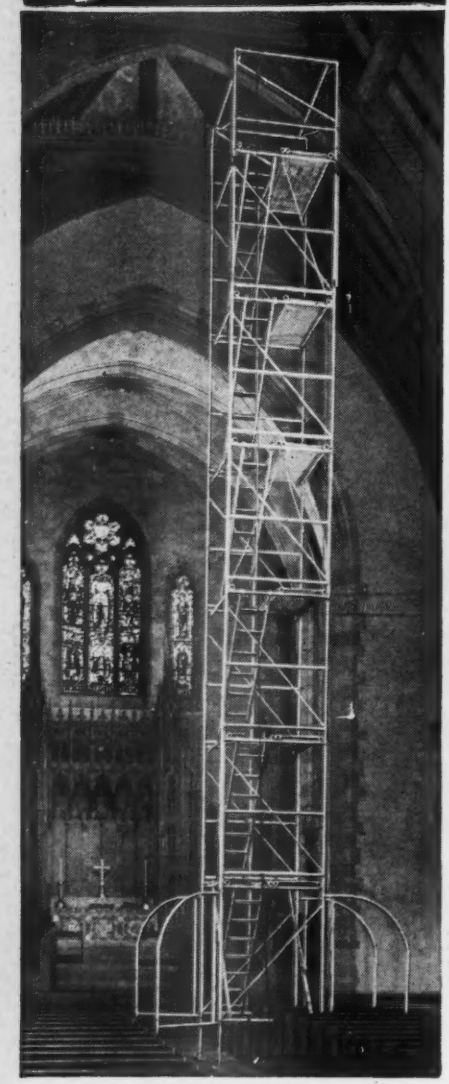
Wakefield Over-ALL Lighting

FOR OFFICE • DRAFTING ROOM • STORE AND SCHOOL

DES. PAT. 148, 191

THE STAR — THE GRENADIER IV — THE COMMODORE — THE DIPLOMAT

NEW!
Aluminum-Alloy
"UP-RIGHT"
SCAFFOLDS
MOBILE 45' UNIT TAKES ONLY 15 MINUTES TO ERECT



Electrical work by Interstate Electric Co. in Trinity Church, Springfield, Massachusetts.

Rolled easily from position to position. Bridges obstacles with ease. A 7 foot, single section unit requires one man only a minute to erect; a 45 foot multiple unit only 15 minutes. Stronger than structural steel yet one-third the weight. Safety-tread stairway completely within the structure. No wrenches, wing nuts, bolts, loose parts. Each section folds flat.

Write for Descriptive Circular

UP-RIGHT SCAFFOLDS

ROOM 107 - 1013 PARDEE ST.
BERKELEY, CALIFORNIA
Offices in All Principal Cities

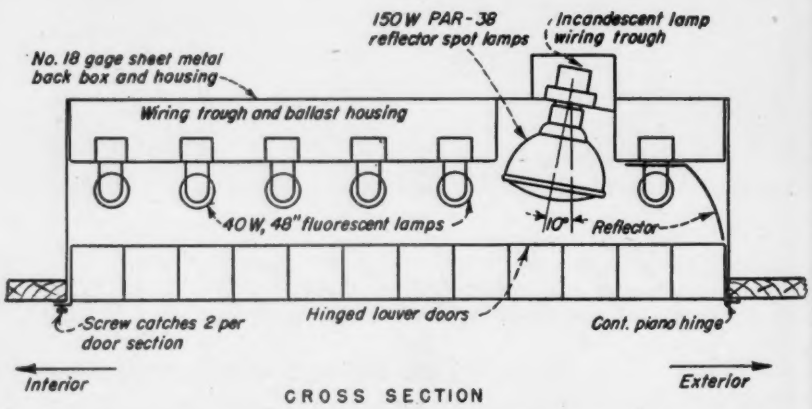
Brilliant Setting For Jewelry

The studied combination of fluorescent and incandescent illumination, mounted above the metal cellular ceiling of the Smith Patterson display windows, Boston, Massachusetts, creates an effective setting for the rich presentations of sparkling glassware and lustrous metal. Designed by lighting consultants of the Boston Edison Company, the installation has a connected load of 70 watts per square foot, producing a brilliant staging for quality merchandise.

Mounted end-to-end parallel to the glass windows, 40-watt 48-inch white fluorescent lamps create continuous rows across the entire display area. Five rows on approximate four-inch centers are mounted normal to baked white enamel wiring troughs and ballast housings which occupy the rear 19-inches of the 30-inch deep ceilings. Directly over the window frame, another continuous row of fluorescent lamps is positioned, with a parabolic reflector so designed that the light from this source is directed upon the front side of the louvers, thus minimizing the contrasting color effect produced by incident light from the incandescent lamps which are positioned on 18-inch centers between the two banks of fluorescent units. Incandescent lamps are 150-watt PAR 38s, mounted with their axis 10 degrees from the perpendicular and so directed that the centers of the incandescent beams are focussed on the center line of the display windows.

Beneath the lighting installation, eggcrate-louver sections having 2.5-inch cubicle cells provide a visual cut-off of 45 degrees normal to the fluorescent lamps. To facilitate cleaning and relamping, louvred sections are piano-hinged directly above the window line and are constructed in four-foot sections to coincide with the four-foot 40-watt fluorescent lamps. Displays are brilliant and effective.

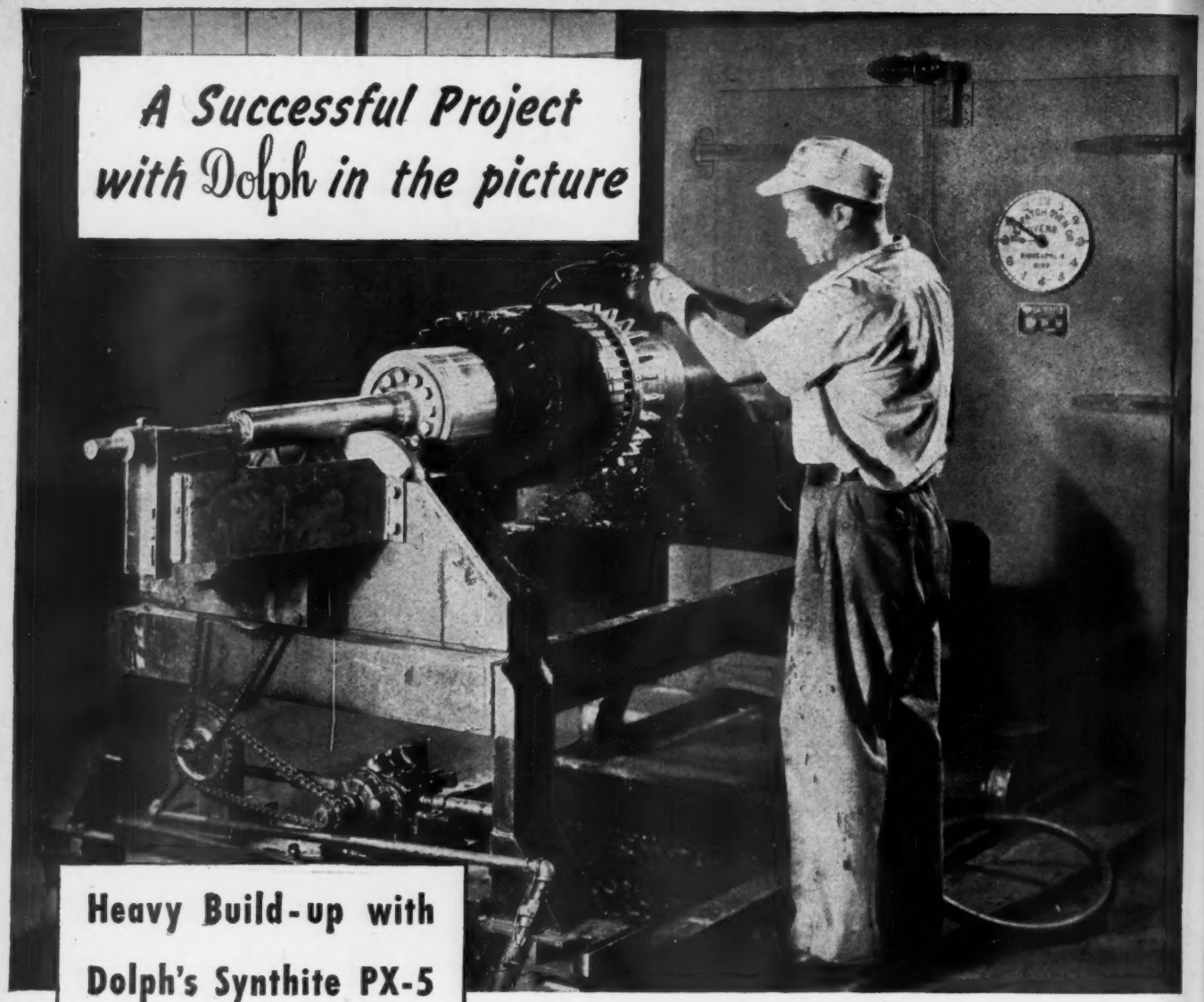
Display window of Smith Patterson in Boston, Massachusetts, utilizes eggcrate ceiling to shield combination of fluorescent and incandescent lamps. Connected load of 70 watts per square foot creates brilliant setting for rich display of glassware and precious metals.



CROSS SECTION

Recessed above louvred ceiling panel are six continuous rows of fluorescent lamps and a single row of 150-watt PAR-38 reflector spots mounted on 18-inch centers.

Now! STANDARD EQUIPMENT WHICH GIVES
Custom Designed
LIGHTING
"Pittsburgh"
Permaflector
PITTSBURGH REFLECTOR COMPANY PRESENTS FOR THE FIRST TIME a line of recessed units in architectural modules—whose application is limited only by the requirements of the designer. These units may be mounted individually, in continuous rows, patterns and squares.
FOUR INTERCHANGEABLE SHIELDING ASSEMBLIES provide every type of shielding. Each Assembly is self-contained within a metal frame and quickly attaches to the Trotter. Frames are piano hinged and latched to simplify maintenance.
COMPANION INCANDESCENT EQUIPMENT, designed especially for use with Universal Trotters, complements the line and gives the "accent" lighting needed for planned lighting installations.
For details on the Universal Trotter and companion equipment, send for Advance Notice Sheet 40.
PITTSBURGH REFLECTOR COMPANY
OLIVER BUILDING · PITTSBURGH 22, PENNSYLVANIA
MANUFACTURERS OF FLUORESCENT AND INCANDESCENT LIGHTING EQUIPMENT
DISTRIBUTED BY BETTER ELECTRICAL WHOLESALERS EVERYWHERE
Permaflector Lighting Engineers in All Principal Cities



Pouring it on . . THICK

A full five mil build-up with each coat of Synthite PX-5 . . . that's just one of the many reasons why Hanson-Van Winkle-Munning engineers prefer Dolph Black Baking Varnish.

Low-voltage motor generator sets built by Hanson-Van Winkle-Munning must withstand high ambient temperatures and high humidity, corrosive fumes and metallic dust naturally prevalent in electroplating and electrotyping plants.

Big stators, part of these same sets, are *immersed* in the deep varnish tank below, for their varnish bath. And, Dolph's Synthite PX-5, Black Baking Varnish bakes out completely in 4-8 hours, at temperatures from 275° to 300° F.

Why not let our Service Engineering Department study your production problems to give you the right insulating varnish for the job *you* have to do. They'll help put your treating cycle on a profitable basis, too. Write for our catalog or for technical assistance. John C. Dolph Co., 1056 Broad St., Newark, N. J.

Dolph's

Member Electrical Insulating Varnish Section, NEMA

INSULATING VARNISH SPECIALISTS

Motor Shops

Compact work and insulation storage table keeps materials in orderly fashion and within easy reach of the mechanic.

Compact Table for Insulation Storage

Wasted steps are practically eliminated in the insulation department of Domizio & Everts, Inc., Yonkers, N. Y. motor repair shop. All materials are within easy reach of the workman.

James Domizio designed and built an insulation storage and work table that holds almost every type of insulation used in his shop. Entered in the 1948 NISA Awards Contest, this data was released for publication through the courtesy of the 1948 Awards Committee of the National Industrial Service Association.

The table is 5 feet long, 4 feet wide and 34 inches high; has a Masonite top and chrome edge. Each end of the table holds two rolls of insulation paper and has an extension bracket for an additional roll if necessary.

Six drawers, each extending the full depth of the table, accommodate sheet paper, fibre, mica and other sheet insulating materials. On each side of the drawers are ten pigeon-holes (running the full depth of the table) for storing such items as slot fibre, wedges, sleeving and other items.

Domizio feels the investment is paying dividends in better housekeeping and more efficient operation.

Structural Beam Supports Chain Hoist

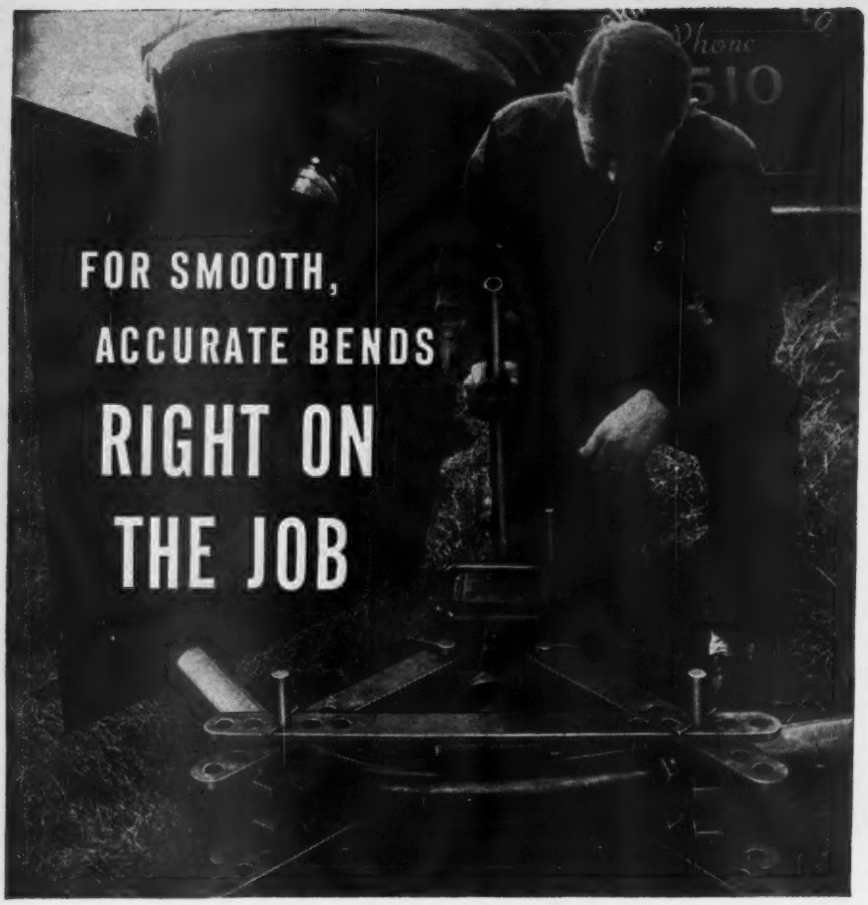
Structural beams in the new motor repair shop of the Superior Electric Company, Springfield, Mass., serve a double purpose. In addition to supporting the roof and stationary suspended equipment in the shop area, they serve as a track for traveling chain hoists. Rollers ride on the upper surfaces of the lower flange and the hoist is supported by a steel bar which passes beneath the girders and connects the two sets of rollers. In laying out the new shop area, all heavy operations have been concentrated in line beneath these main I-beams so that, with chain hoists running the length of the shop, loads can be readily shifted without the necessity of auxiliary dollies, cranes or booms.

Structural roof beams support rolling chain hoists in addition to supporting roof beams and stationary hanging equipment in shop area.

Frame Bolts Improve Working Plane

When stator frames are placed on work benches in the Electric Repair Shop of Hazleton, Pa., bolts are inserted in the upper two threaded holes designed to receive the end-bell bolts. In this manner, the frames rest on the bolts and on the frame base. Two advantages result. The working plane is inclined, making it easier for the electrician to handle coils and tools, and all pressure is removed from the underside of the coils, protecting them against scaping or other damage. When it becomes necessary to turn the frame over, the bolt legs are merely unscrewed and inserted in the corresponding holes on the opposite side.

Leroy Lindemuth inserts bolts into holes in upper part of stator frame so that underside coils are protected against abrasion while working plane is inclined to a more convenient angle.



GREENLEE HYDRAULIC BENDER

Whatever the job location, the portable GREENLEE Hydraulic Bender can be taken *right to the spot* where the work is to be done.

Bends are quickly made exactly where and when wanted . . . tailored to the exact requirements of the installation. For example the GREENLEE Bender owned by the Griffin Electric Company of Owensboro, Kentucky, is shown above on job location where it was used to bend various sizes of conduit from ½" to 4½".

"Where promptness and swiftness are the main factors on a job, the GREENLEE is always used to save time and materials and eliminate need for manufactured fittings," reports this company.

With the GREENLEE, *one man* quickly makes smooth, precise bends in pipe up to 4½", rigid and *thin-wall* conduit, tubing, bus-bars. This means as high as 75% labor savings, many owners report, with material spoilage reduced to practically nothing.

Get facts today on the timesaving GREENLEE Hydraulic Bender which often pays for itself on the first few jobs. Write Greenlee Tool Co., Division of Greenlee Bros. & Co., 1741 Columbia Avenue, Rockford, Illinois.

TOOLS FOR CRAFTSMEN

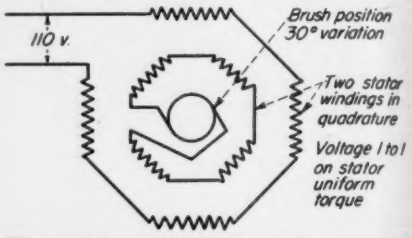
GREENLEE

OTHER GREENLEE TIMESAVING TOOLS FOR ELECTRICAL WORK

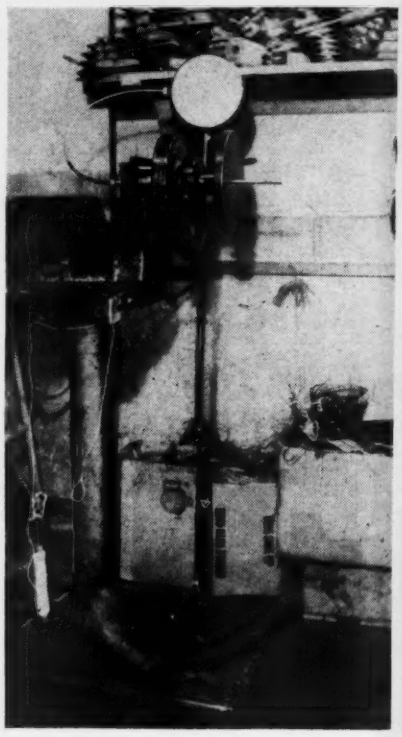
Hand Benders • Joist Borers • Cable Pullers • Radio Chassis Punches • Pipe Pushers

Variable Speed Motor for Coil Winder

Ray Bright of the Standard Electric Service, Los Angeles designed this winding machine with a special, variable speed motor, which does away with speed control devices other than a simple foot pedal which shifts the brushes. The speed of the motor can be varied from 0 to 3000 rpm. After the power has been transmitted by a gear train made up of Buick and Ford timing gears, the speed drops to a maximum of 1000 rpm. at the winding head.



Two stator windings and variable brush positions are unique features of coil machine in shop of Standard Electric Service, Los Angeles, Calif.



Brushes are shifted by pressure applied to foot pedal and speed of winder can be varied in this manner from zero to 3000-rpm.

The motor is designed with two stator windings in quadrature with a voltage ratio of 1 to 1 in the stator. Such a winding (see sketch) gives a uniform torque and the brush shift is over an arc of 30 degrees. In the Standard Electric Service shop, the motor is connected to 110-volt service, and the unit has given excellent service.

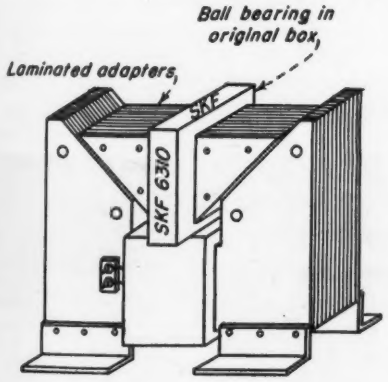
Use of Growler As Induction Heater

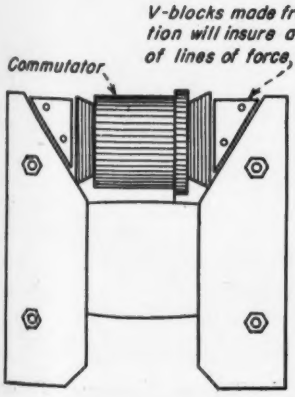
Practically every motor repair shop has a growler for testing purposes. In many shops that is the only function of the unit. In Cambridge, Mass., however, Erik Gyllenberg, supervisor of the mechanical department, of the Electrical Installation Company, is making their shop growler do double and triple duty—as an induction heater.

His idea was of sufficient merit to take second prize in the 1948 NISA Award Contest. Details are released for publication through the courtesy of the 1948 Awards Committee of the National Industrial Service Association.

Gyllenberg first used his growler as an induction heating device to expand ball bearings for a good shaft fit. Bearings can be easily damaged if driven on and often dirt enters the ball race. Open flame heating may alter the bearing temper or cause uneven expansion. Bake oven heating is slow and often very inconvenient. A hot oil bath is inconvenient, dangerous to the worker and a fire hazard. The growler proved to be the quickest, safest and cleanest method.

Manufacturers specify 200°F. as the maximum safe limit to which a bearing can be heated. Shop tests revealed that, when heated in a growler, a ball bearing will give off a slight smoke or haze



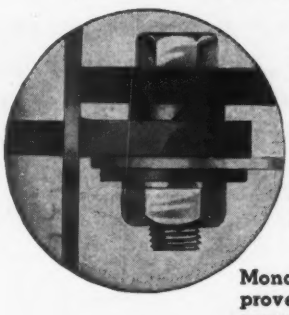


Conventional shop test growler doubles as an induction heater; (top) to expand ball bearings and (bottom) to heat a commutator assembly.

New POSITIVE LOCK
Construction of
Monarch Renewable
Fuses
Assures →
TRUE ALIGNMENT

The brass lugs inside the caps used on Monarch Fuses (see illustration at right above) fit into equally spaced slots in the brass casing inserts. This new and improved Monarch construction assures true alignment of the copper holding terminals . . . and establishes a positive lock on both ends of the fuse.

and for
STILL GREATER PROTECTION . . .



MONARCH'S Compressed Tension Lock Washer construction (illustrated at left) compensates for contraction and expansion of the fibre bar by exerting constant tension on the bar . . . and assures no loose parts. The washer also separates the fibre bar from the copper terminals . . . a spacer to provide better cooling.

Monarch Fuses are fully approved and are available through recognized wholesalers.

Specify Monarch Fuses
for improved
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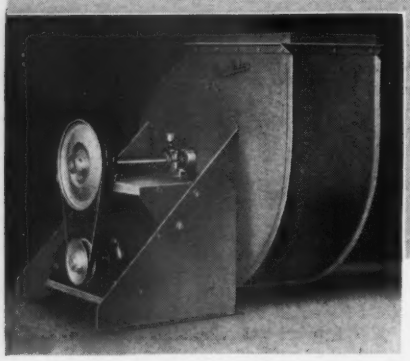
MONARCH FUSE CO., LTD.
116 E. FIRST ST., JAMESTOWN, N. Y.

Built TO DO A JOB For You and Your Customers - these popular "Buffalo" Fans



BUFFALO BELTED VENT SET

BUFFALO BREEZO FAN

• "Easy to sell, easy to install and service" is the reputation "Buffalo" Fans like these have earned with contractors. And "Buffalo" Fans help your reputation because, once on the job, they give customers their "money's worth" and more. "Buffalo" Belted Vent Sets are ideal light-weight units for centralized store, theatre, shop ventilation. Extremely quiet and high in efficiency, they are very versatile —capacity can be changed after installation by changing pulleys. "Buffalo" Breezo Fans move air at practically negligible costs—are easily installed and almost everlasting on the job. Six sizes 8" to 24".

Write for Bulletins 3499 and 3222-F and get the profit facts!

"Buffalo" "First For Fans"

PERMANENT SATISFACTION IN AIR HANDLING

BUFFALO FORGE COMPANY

520 Broadway, Buffalo, N. Y.
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.
Branch Offices in all Principal Cities

BREEZO FANS
BELT AIR FANS
BELTED VENT SETS
"E" BLOWERS

(oil film on bearing) at about 180°F; also, at this temperature the bearing is expanded enough to slip on the shaft.

As shown in the illustration, bearings are left in their original packages during heating. It takes about three minutes to reach 180°F., depending on the size of the bearing and size of growler used. In some instances it may take only one minute.

The same technique works equally well on gears and couplings.

Gyllenberg also uses the growler to heat commutator assemblies during rebuilding. The heat generated in the steel shell rapidly heats and softens the mica without carbonizing or drying out its binder. Because the core heats and expands first, the commutator nut may be tightened without heavy pounding.

When mounting commutator and slip-ring assemblies on shafts, considerable labor can be saved by heating the cores and spiders on the growler, then slipping the hot assembly on the shaft.

The growler also comes in handy for disassembling certain jobs. Recently at the Electrical Installation Company shop, a new rolled shell, shaftless stator came in for reconnection. The stator was mounted in the head of a drill press with such a tight fit that the head had to be expanded. The drill press head was put on the growler and in a few minutes the stator could be pulled out by hand.

V-shaped adaptor blocks made of steel laminations are inserted between the work and the growler face to provide a maximum uniform heating surface.

Kenneth L. Frease, manager, Frease Electric Co., Canton, Ohio, specializes in industrial and commercial electrical construction; promotes higher standards for residential wiring.

New H&H No. 9260

BACK-WIRED (or side wired) DUPLEX

T-SLOTS • DOUBLE SIDE CONTACTS PLASTER EARS

This advanced design provides for either *back* wiring or *side* wiring with equal facility. Back-wiring feature makes easier, more secure installation. Built-in stripping guide assures correct stripping; eliminates exposed wire. Individual terminal clamps hold wires with a no-slip grip. Other structural features are:

CONVENIENCE OUTLET

- Large Recessed Binding Screws
- Ample for No. 10 Wire
- Strong Plastic Base
- Double T-Slots
- Double Side Contacts
- Washer Type Plaster Ears

Large recessed binding screws, ample for No. 10 wire;

Strong plastic base;

Double T-slots;

Double side contacts;

Washer type plaster ears.

Listed as standard by Underwriters Laboratories, Inc. and meets all high-grade specifications. Specify No. 9260 for brown plastic base; No. 9260-I for white Ivorylite.

10 AMPS. — 250 VOLTS 15 AMPS. — 125 VOLTS

Mail this Coupon

To Arrow-Hart & Hegeman Electric Company, Hartford 6, Conn.

Send us your catalog data-sheet on the new 9260 Back-Wired Duplex Convenience Outlet.

(*Name*) _____

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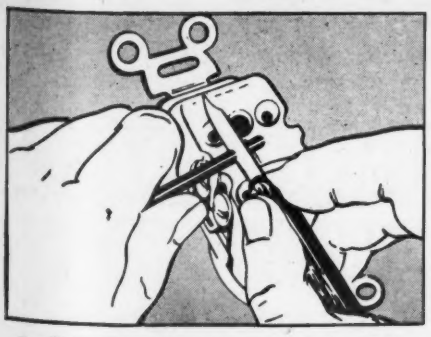
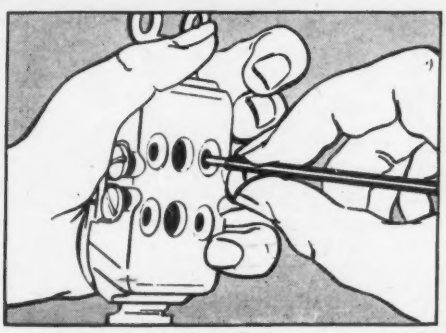
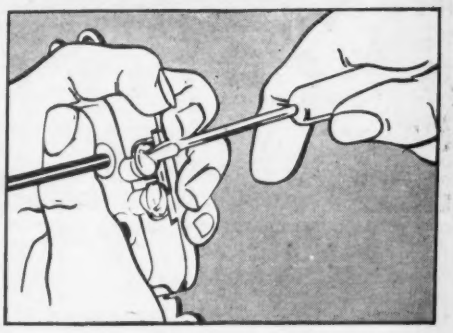
THE ARROW-HART & HEGEMAN ELECTRIC COMPANY, HARTFORD 6, CONN., U.S.A.



1. Strip off insulation to exact length, quickly and easily, using built-in stripping guide.



2. Loosen terminal screw — Wire stripped to correct length is inserted from back.



3. Tighten terminal screw — Individual clamps grip securely with no exposed wire.

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In the News

Billion Dollar Hospital Program

More than 500 civilian hospitals are to be built under the Federal aid hospital program. Most of the hospitals will be built in non-urban areas.

Appliance manufacturers and distributors already are receiving orders for hospital equipment, and contractors are bidding, or working, on wiring jobs for the 101 hospitals under construction. Though the U. S. Public Health Service maintains general supervision of the program and the Federal funds invested, construction, equipment and service contracts are awarded by the local groups which put up two-thirds of the cost of each project.

Approved by Congress in 1946, with a pledge of Federal funds at the rate of $75,000,000 a year for five years, the program lagged while the states surveyed their hospital needs. First Federal funds became available in July, 1947, but actual construction began rolling only in recent months. Public Health Service now has approved plans for more than 300 new hospitals, for numerous additions to existing hospitals, new clinics and laboratories.

About two-thirds of the approved hospital projects are planned for communities of less than 10,000 population. Public Health Service sources report the non-urban emphasis of the program is already producing construction problems. Electrical contractors with experienced crews are scarce in such areas, they say.

Standards for electric service, wiring and installations at Federal aid hospitals are being prepared by Public Health as a guide for wiring. The wiring specifications follow closely the National Electrical Code.

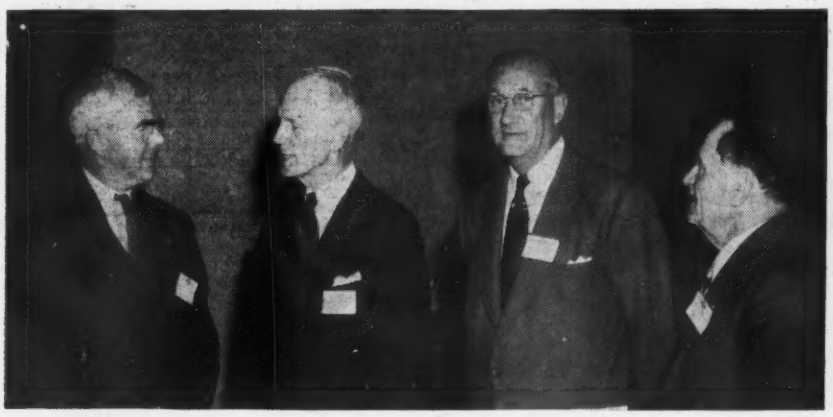
The Standards recommend lighting designed for "comfortable seeing" throughout every hospital. Lighting intensities should range from 5 footcandles in corridors, private rooms and wards, to 1,000 footcandles over major operating tables.

Electric service may be primary or secondary, depending on "load demands and other local conditions." Service conductors into hospitals should be underground where possible. A 3-phase, 4-wire, 120/208-volt wiring system was recommended as "cheaper" and having other advantages.

Emergency power may be assured through service from two independent generating plants, from separate transmission lines of a network system, or from storage batteries or a standby generator maintained by the hospital.

The P.H.S. standards recommend electric clock, alarm and signal systems, but calls for no equipment involving a selection between competitive fuels. Unlike the veterans administration, whose hospital program bogged down last year in bickering over electric vs. gas stoves for kitchens, P.H.S. wants no part of any such argument.

James D. Lynett, Superintendent, Bureau of Electricity, New York Board of Fire Underwriters, and Chairman for the IAEI Eastern Section's 1948 Annual Meeting at Atlantic City, N. J. (left), together with W. C. Field, Electrical Inspector, City of Springfield, Mass., and J. M. Cosgrove, Engineer for the National Electric Products Corp., Pittsburgh, listen attentively to L. Alan Sharp (right), Design Engineer for National, while he discusses the new trends in distribution systems.



Interpretation of some Code articles is the subject under discussion by L. B. Disbrow, Electrical Contractor, Meriden, Conn.; William J. Canada, Consulting Engineer, Mountain Lakes, N. J.; George H. Schardien, Chief Inspector and Examiner, Electrical Department, City of Elizabeth, N. J., and Max E. Rischall, Electrical Contractor of Meriden, at Atlantic City IAEI convention.

Proposed Changes In Wage-Hour Law

Secretary of Labor Maurice J. Tobin and Wage-Hour Administrator William R. McComb are drafting proposed changes to the wage-hour law which would nullify the Supreme Court's "overtime on overtime" decision in the Bay Ridge stevedoring case.

The plan has the backing of the American Federation of Labor and is likely to be adopted by the Democratic-controlled 81st Congress next year.

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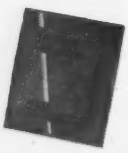

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Arden O. Hyde, Chief Electrical Inspector, New York Fire Insurance Rating Organization, and Elmer T. Quinn, Chief Electrical Inspector, Department of Public Safety, City of Newark, N. J. look forward to greater safety due to Code discussions at the Eastern Section IAEI annual meeting.

In negotiations which led to the settlement of the East Coast dock strike, Tobin promised to ask Congress to validate the traditional longshore contract under which dock workers got time and a half "overtime" for any work outside the regular daytime weekday hours. The Supreme Court raised a threat to continuance of those premium payments when it held that they were not true "overtime", but merely extra compensation for working at unusual hours. Thus, for work beyond 40 hours, employers would have to include the time and a half in the "regular rate" of pay and pay time and a half on top of it.

Tobin's proposal, if adopted, will legalize as overtime pay the time and a half which some contractors have been paying for any work performed before 8 a.m. or after 5 p.m. and for holiday, Saturday and Sunday work.

This goes further than the amendments McComb had in mind, but no doubt it will be included in the administration's plan. McComb, in his tentative draft of what Congress should do, urged that Congress define the term "regular rate" on which time and a half overtime must be paid. In his proposed definition, he would classify as real overtime all time and a half paid after eight hour day and on holidays, Saturdays, Sundays and the sixth or seventh day of a work week. He would not have included time and a half for night work as such, as Tobin contemplates doing.

How the wage-hour law, as it now stands under the Bay Ridge decision, affects the construction industry was explained by Harry Weiss, director of

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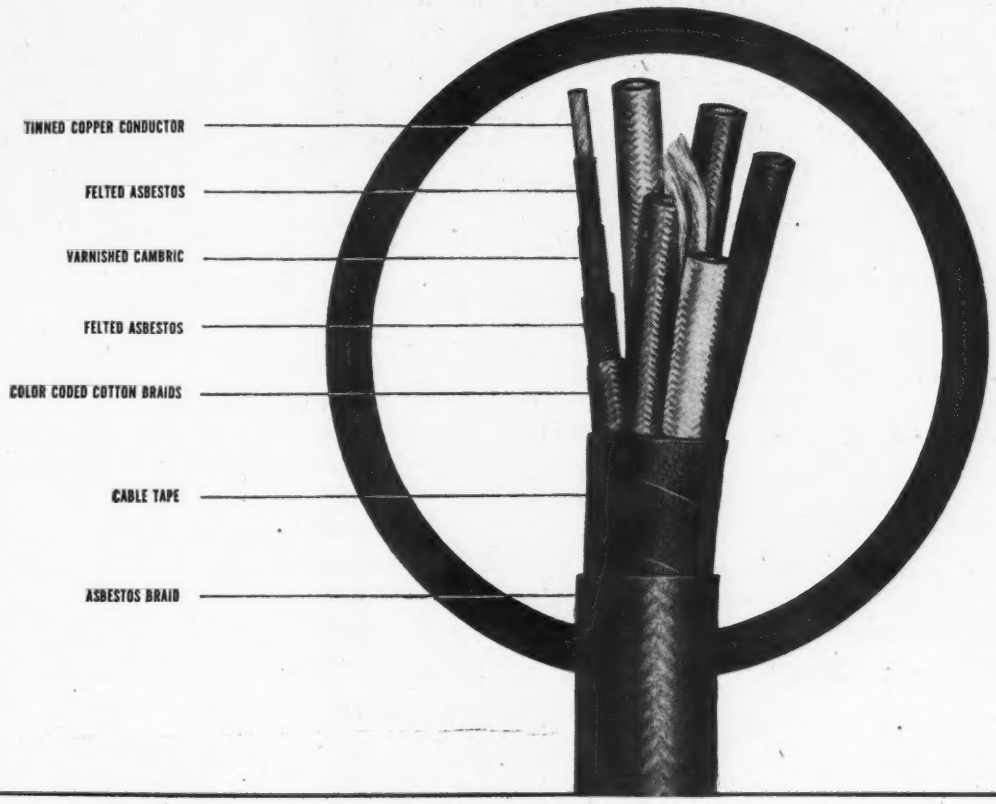

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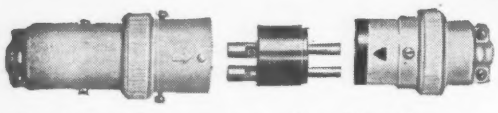

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the wage-hour office's wage determination and exemption's branch, at a meeting of the Associated General Contractors' Northern California Chapter in San Francisco, Dec. 3.

The principle to keep in mind, Mr. Weiss said, is that only those premium payments "that are contingent upon the employees having previously worked a specified number of hours or days, in accordance with a bona fide standard, may be considered true overtime payments." This means that time and a half for working at night, on holidays, Saturday or Sunday, is merely higher straight-time pay for working at an undesirable time, he said.

"There is no single and exclusive test for what constitutes a bona fide standard," according to Mr. Weiss. "It may have been established through collective bargaining or because of statutory requirements, or as a result of the employer's established practice."

He gave these examples of what extra payments are true overtime premiums which don't have to be included in the regular rate and may be credited toward any overtime pay due under the law:

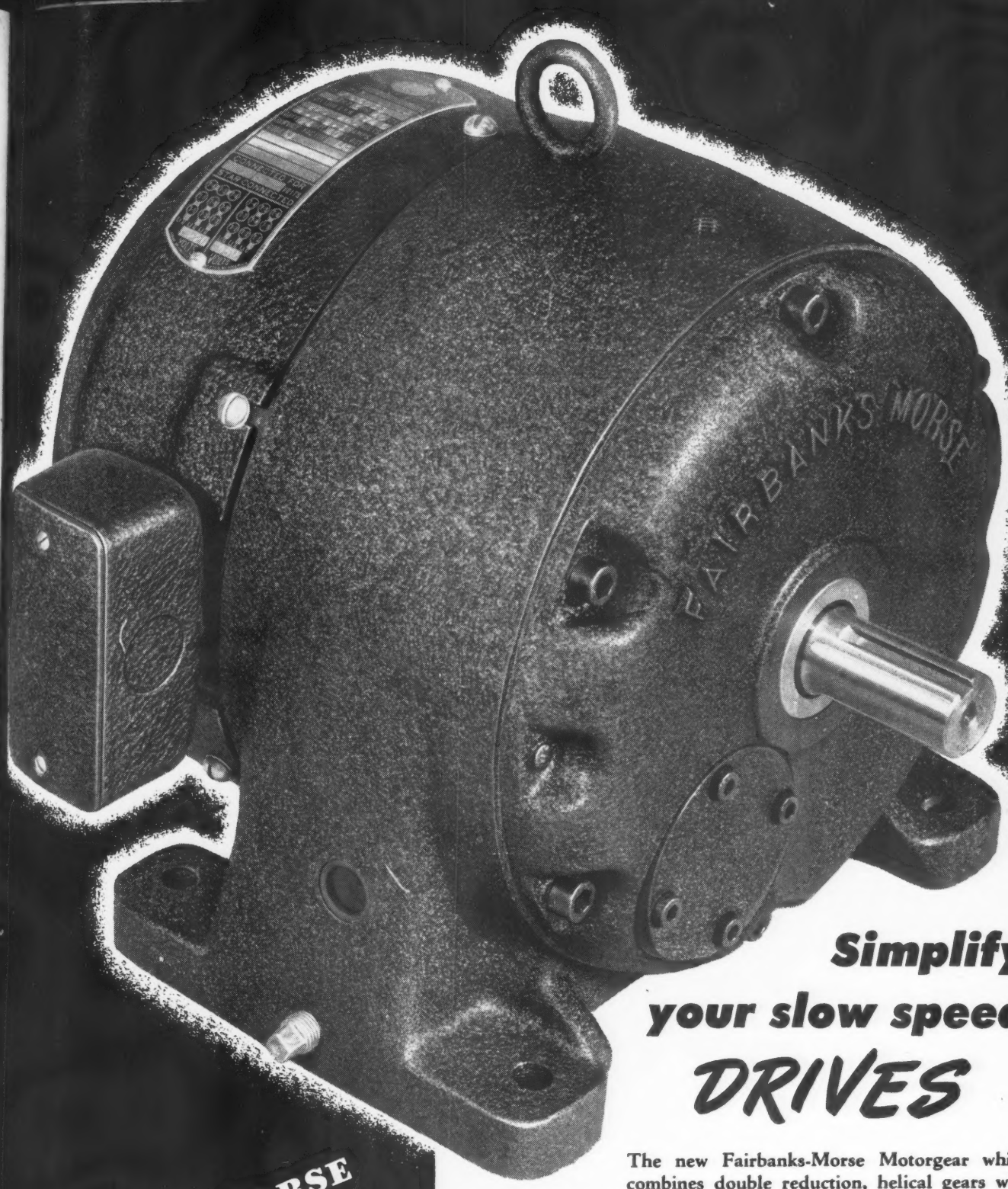
1. Premium pay, under a union contract, for work beyond a specified standard number of hours, e.g., eight a day or 35 a week.

2. Extra pay for night, Saturday or Sunday work, if the pattern of employment establishes the fact that that work normally falls within true overtime hours set by contract or practice. That is, after the employees have previously worked the period specified as the bona fide standard. This is true even though the employee, on infrequent occasions, may not work the full standard of hours because of an occasional excusable absence due to a holiday, illness or similar cause.

(However, if as a rule the employees work sporadically during the week, so that Saturdays, Sundays and night work does not normally fall after employees have worked a standard number of hours, any premium pay for work at those times would not count as real overtime. Furthermore, the extra pay would have to be included in computing the regular hourly rate.)

These payments, Mr. Weiss said, are not true overtime:

1. Premium pay for work before and after specified shift hours, commonly called "clock-overtime". That is, if there is no requirement that the employee must have previously worked a bona fide standard of hours in the day. There is one exception to this: If the contract calls for "clock overtime" and also for overtime pay after a standard number of hours in the day, and if the "clock overtime" normally falls after the employee has already worked the standard hours. In such a



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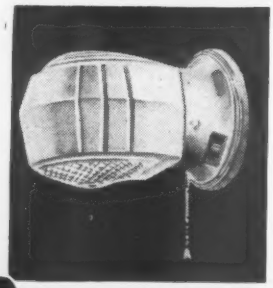

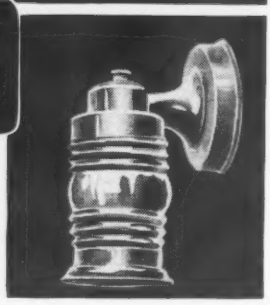

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case, the overtime pay would be real overtime.

2. Extra pay for holidays. This is not overtime pay because holidays do not occur consistently after a specified number of hours are worked or on any fixed day in the week. The extra pay must be included in computing the "regular rate."

(However, pay for a holiday not worked need not be included in the "regular rate" and, of course, can't be offset against any overtime due under the law.)

What about the man who gets paid for a holiday not worked, but is called in to work? According to Mr. Weiss, if he gets straight time or more for working, in addition to the pay he gets for not working, the amount he gets for working must be included in the "regular rate" but what he gets for not working would be excluded.

This is how Mr. Weiss said to compute the "regular rate":

Divide the total compensation for the workweek, minus any true overtime premiums, by the number of hours worked by the man in the week.

Lighting Contest

The Merit Award Competition, offering prizes and certificates to contractors for outstanding lighting installations, closes January 15. Entries in the Lighting Merit Award Competition under the auspices of the Third International Lighting Exposition are expected to far exceed the hundreds submitted in last year's contest.

Case Study Entries are flowing steadily into the offices of the Merit Award Committee, 326 West Madison Street, Room 818, Chicago, Illinois. Here they are being held until the close of the competition, when they will be reviewed by a board of five judges who will choose the winners that are to receive the 15 Gold Seal Awards of $100 each and the handsomely engraved Merit Award Certificates.

The contest is under the auspices of the Third International Lighting Exposition which will be held next March 29 thru April 1, sponsored by the Industrial and Commercial Lighting Equipment Section of National Electrical Manufacturers Association.

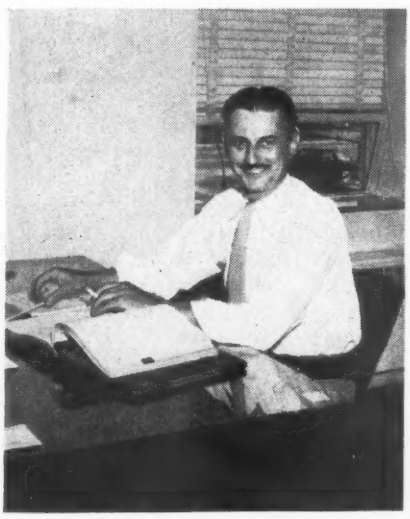
This year's Case Studies, which promise to exceed in number, those of the previous competition, differ in several important respects from last year's entries. All Case Studies this year are submitted in uniform fashion; they are required to be mounted on standard mounting board, 24 by 36 inches, suitable for wall hanging. One reason for

this provision is that the winning entries will be prominently displayed at the Third International Lighting Exposition, as a source of ideas for lighting men, architects, engineers, electrical contractors and wholesalers, and users of lighting who will be in attendance.

Another requirement placed on this year's entries is that they be limited to the solution of a single lighting problem, but this does not limit the number of photographs or drawings which may be used.

In announcing the imminent closing of the competition, R. D. Bradley, Chairman of the Merit Award Competition Committee states: "We are greatly pleased with the large percentage of joint entries and the high caliber of material indicated in the Case Study entries now arriving. In the relatively few years since this competition was inaugurated, the Merit and Gold Seal Awards have become among the most highly coveted honors that can be received for excellence in planned lighting programs. Utility companies, electrical contractors and wholesalers and firms of lighting engineers are urging their men to enter and thus win recognition for the company as well as for themselves.

"Perhaps one reason that these Merit Awards are so eargerly sought is that winning Case Studies are made available to editors of leading business, professional and trade magazines who makes these entries the basis for Planned Lighting articles. More than 100 such articles have appeared during 1948 and have attracted very favorable attention and comment."



An adequate bookkeeping system coupled with accurate cost records is the backbone of successful business operation believes O. W. Knoph, treasurer, Harlan Electric Company, Detroit electrical contracting organization.

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No. 470 "Latrobe" Pipe or Conduit Hanger

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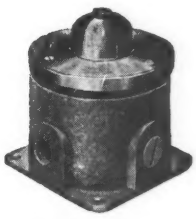
No. 110 "Latrobe" Watertight Box

Tested and approved by Underwriters Laboratory. Iron box body with 3½" round brass cover plate. No. 208 fits tapered opening in top of box body.

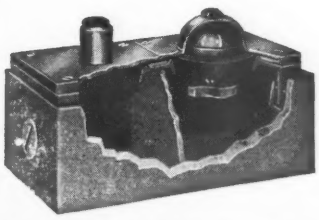


No. 150 Box, No. 207 Nozzle

Adjustable and watertight for use in concrete or wood finished concrete floors. Neat, compact and quickly installed.

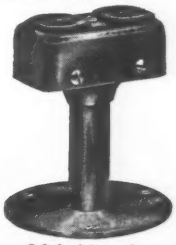
No. 280 Nozzle with No. 200 Cover Plate

10 Amp. 250 Volt Receptacle in brass housing, mounted on ½" brass pipe extension 3" long—longer extension available if desired.



No. 252-R Two Gang Box

This adjustable, watertight "Latrobe" Floor Box has No. 208 Receptacle in one section. One cover plate has ½" flush brass plug; the other, 2".



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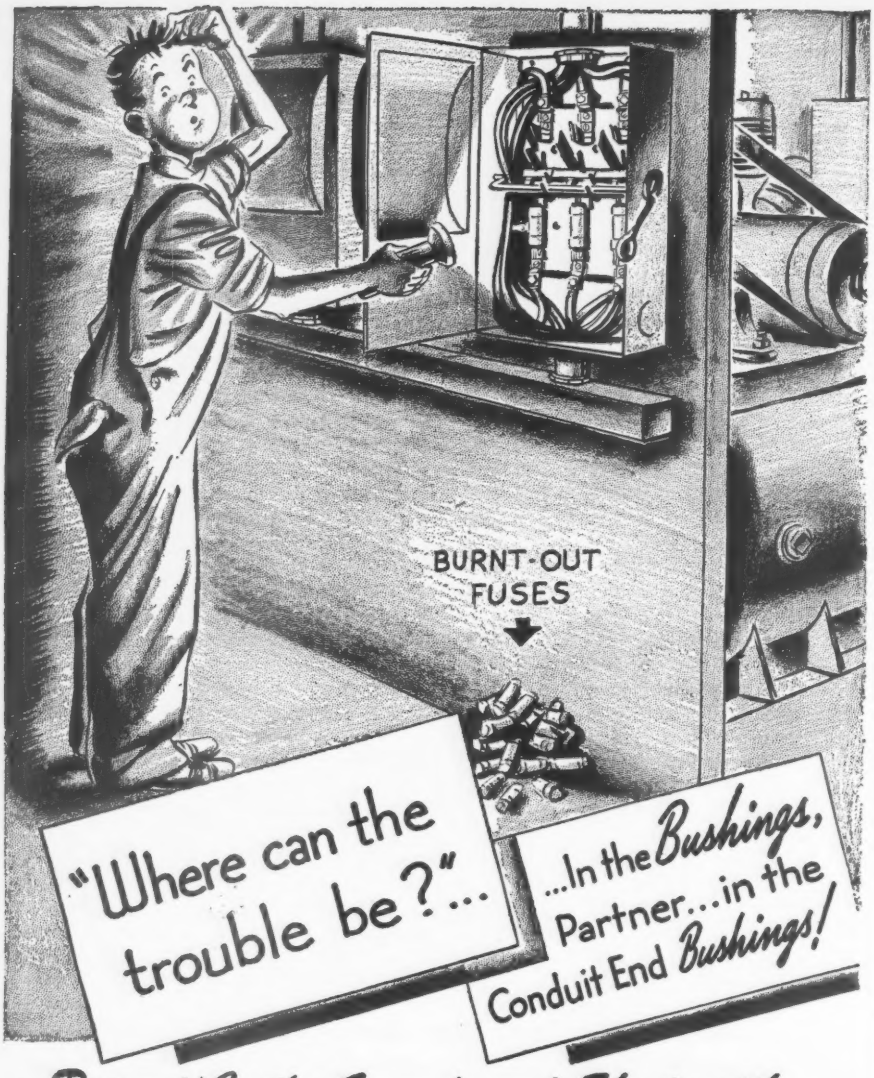

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IES Scholarship Winners Announced

University of Illinois junior, R. F. VandenBoom of Quincy, Ill., and senior Alvin S. Levine were recipients of the first Illuminating Engineering Society Scholarship established at the University last year by the Chicago Section, I.E.S. Two $250 awards are presented annually to a junior and senior student in the illumination option of the electrical engineering course. Selection is made by the university committee on scholarships.

Funds to set up the scholarships for a five year period were derived from the proceeds of an all-industry dinner sponsored by the Chicago Section at the Second International Lighting Exposition. Plans are now being formulated by the Section to maintain this scholarship for promotion of professional training in illuminating engineering.

Overtime Pay Granted on Work in Foreign Countries

Government-leased bases in foreign countries are United States "possessions" on which contractors must pay workers time and a half after 40 hours a week and meet other requirements of the Fair Labor Standards (Wage-Hour) law.

That is the decision of a sharply-divided U. S. Supreme Court in granting overtime pay demands sought by 11 wartime employees of three contractors who did business as the "Bermuda Base Contractors" on the contruction of Fort Bell and Kindley field in British-owned Bermuda. The contractors are Vermilya-Brown Co., Inc., Necaro Co., Inc., and Arthur A. Johnson Corp.

The 5-4 split decision affirmed a ruling of an appeals court and was opposed by the State Department, the Justice Department and the Wage-Hour Administration. Because this work is done under government cost-plus contracts, it means that the government will have to foot the extra bill. Government sources could not say how much money was involved in this decision or how much will be involved in future cases under this principle.

The chief liability is for overtime pay, and the Portal-to-Portal Pay Law has put a two-year statute of limitations on all claims under the wage-hour law. Most of the overtime was worked during the war. Claims which were not filed within two years will have no standing in court.

Government employees do not come under the wage-hour law. Several suits have reached the Supreme Court seeking to test whether employees on government cost-plus contracts are working for the government or for the private contractor. The Supreme Court has sent at least two of them back to the lower courts for clarification.

The latest involved M. T. Reed Construction Co., against whom 117 employees brought suit for overtime pay on a seabee project at Gulfport, Miss. The lower court ruled in favor of the workers, but the Court of Appeals reversed the decision. By a 6-3 decision, the Supreme Court said the record was not complete enough to make a decision. It sent the case back to the lower court with instructions to get more facts, but at the same time it dismissed all aspects of the case involving only construction work. The industry is now guessing what the court meant, because it did not write an opinion.

ASA Approves School Lighting Practice

The American Standards Association, Inc. has approved the "1948 American Standard Practice for School Lighting". Co-sponsored by the Illuminating Engineering Society and the American Institute of Architects, it will provide school administrators, architects, engineers and others with a much needed authoritative guide. It is being published under the auspices

E. E. Herndon traces the 16 inspection areas in and around Detroit in which his Reid Electric Company (Highland Park, Mich.) does a man-sized electric range, water heater and clothes dryer installation business. Herndon resigned as Detroit's chief electrical inspector to take over the Reid organization in 1947.

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Material supply situation gets a once-over at Peoria meeting of Illinois Chapter, NECA by (L to R) L. L. Williams, Wesco, Peoria; Lloyd Gerstenberger, electrical contractor of Galesburg, Ill.; and Walter W. Smilde, Graybar Electric Co., Peoria.

of the American Standards Association with the designation "A23.1-1948, UDC 628.9: 727.1".

This Standard Practice replaces the 1938 edition, which had become obsolete since the technique of lighting application in schools has advanced considerably due to the development and study of brightness relationships in the illuminated environment and to the introduction of new light sources. The School Lighting Committee of the Illuminating Engineering Society began work on the proposed revision in 1944 and a finished draft was submitted to the A23 Sectional Committee on School Lighting in 1947. The final draft as approved by ASA was developed under Sectional Committee action.

The Standard Practice encompasses and provides specific recommendations for the many features of a classroom which constitute the visual environment for the students. It emphasizes that the quality of the lighting should be comfortable and non-distracting and that the quantity of light should be in proportion to the severity of the visual work performed. For the first time in a publication of this type, specifications as to maximum fixture brightness and limiting brightness ratios, in addition to footcandle tables, are set forth to assure comfortable and easy seeing conditions in the classroom. To guide the school superintendents in determining a visually comfortable interior decorating scheme, recommended reflectance values for desks, floors, wall and ceiling are given which, with a good distribution of light, will assure properly balanced brightnesses between these areas in the classroom. Illumination results to be expected from a considerable number of lighting instal-

lations, employing both incandescent and fluorsecent sources, are indicated.

The control and use of natural lighting is discussed, using maps and charts which show the amount of sunshine to be expected during the winter school months in various parts of the Country. The relative merits of various fenestration techniques and daylight controls, including directional glass blocks and diffusing screens, are set forth, recommendations being given as to the means of protecting the students from excessive window brightness.

The importance of adequate wiring for today's and tomorrow's needs are stressed in an Appendix and the proper wire sizes are suggested for typical conditions to serve as a guide for the school architects.

School administrators have demonstrated that they are keenly aware that the lighting conditions for their students are far from being good. They no longer ask the question "Why should we improve the students' visual environments?", but today they ask, "How should we proceed with their visual environment improvement program?". The "American Standard Practice for School Lighting" represents the best concerted thinking available today as to the answer to that question.

The new publication may be secured from the Headquarters of the Illuminating Engineering Society, 51 Madison Avenue, New York, 10, N. Y.

Essex League Elects Officers

At a meeting held at Military Park Hotel on November 18, 1948, the Essex Electrical League of Newark, N. J. elected Earle Latham, Vice President

At the recent Annual Meeting of the Eastern Section, IAEI, held in Atlantic City, officers elected for the coming year included Bernard A. McDonald, Electrical Superintendent, N. Y. Fire Insurance Rating Organization, Rochester, N. Y., president; A. W. Hopkins, Springfield, Mass., treasurer, and F. N. M. Squires, Chief Inspector, Bureau of Electricity, New York Board of Fire Underwriters, secretary.

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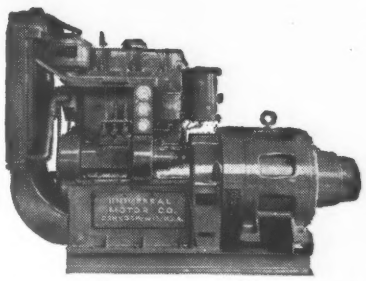
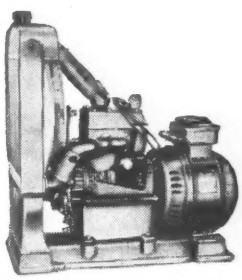


This Universal 3-cylinder 100% full Diesel model provides a steady 15 kw. Other Diesel sets to 35 kw.



In the gasoline-powered series, this small, low-cost model develops 2500-3000 watts.

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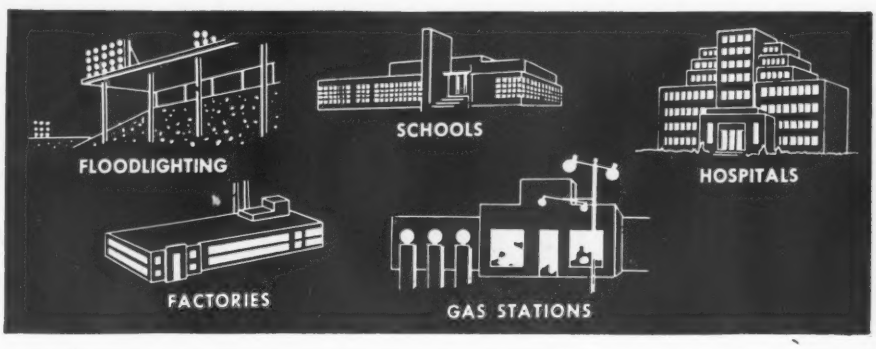

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of E. B. Latham & Co., Newark, Pres. He succeeds Howard B. Snow.

Other officers elected are: Vice President, James Hanbury, Assistant District Manager, Lamp Department, Westinghouse Electric Corporation; Treasurer, Carl Schlaick, District Manager, General Electric Supply Corp.; and Secretary, Spencer A. Moore, Assistant Commercial Manager, Public Service Elec. & Gas Co.

Those named to the Executive Committee are: Alfred Richman of Lightning Electric Service Co.; Frank Neubert of Reynolds Electric Co.; C. A. Stevens, Sales Manager, Electric Dept., Public Service Elec. & Gas Co.; and Edward Krukiel of du Pont Co.

Book Reviews

Contracts and Specifications

The legal and business aspects of "Engineering Contracts and Specifications" are discussed in detail in a revised edition of the war-years book of the same title written by Robert W. Abbett, consulting engineer for Knappen Tippetts Abbett Engineering Company. While contract procedure is developed primarily along the lines of private practice, attention is directed to matters in which government procedure differs, and unique features of government-sponsored construction contracts are explained in detail where they occur in the logical development of the subject. Examples of various contract documents for both private and public works have been included to illustrate the text and for reference purposes. Subjects given particular emphasis include legal considerations, types of construction contracts, bidding procedure, competitive-bid and cost-plus-fixed-fee contracts, insurance and surety bonds and specification elements. Measuring 5½-by-8½-inches and including 327 pages, the book is priced at $3.75 by John Wiley and Sons, Inc., N. Y. C.

Motor Maintenance

Three distinct sections dealing with mechanical maintenance, electrical maintenance, and the operation and application of motors, give clarity and provide rapid reference for readers of "Electric Motor Maintenance" written by W. W. McCullough, District Manufacturing and Repair Department, Westinghouse Electric Corporation. The construction of each motor is discussed in detail, then the methods used to test it are outlined, the necessary tools are listed, and a full account of cleaning and drying is included for

3 fittings

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weigh only as much as

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of old style

and—Fully APPROVED

Approved — by Underwriters, by industrial designers, by public utilities — approved by municipal authorities who have rejected other non-ferrous conduit fittings.

Corrosion - resistant clear through—nothing to wear off or suffer in handling.

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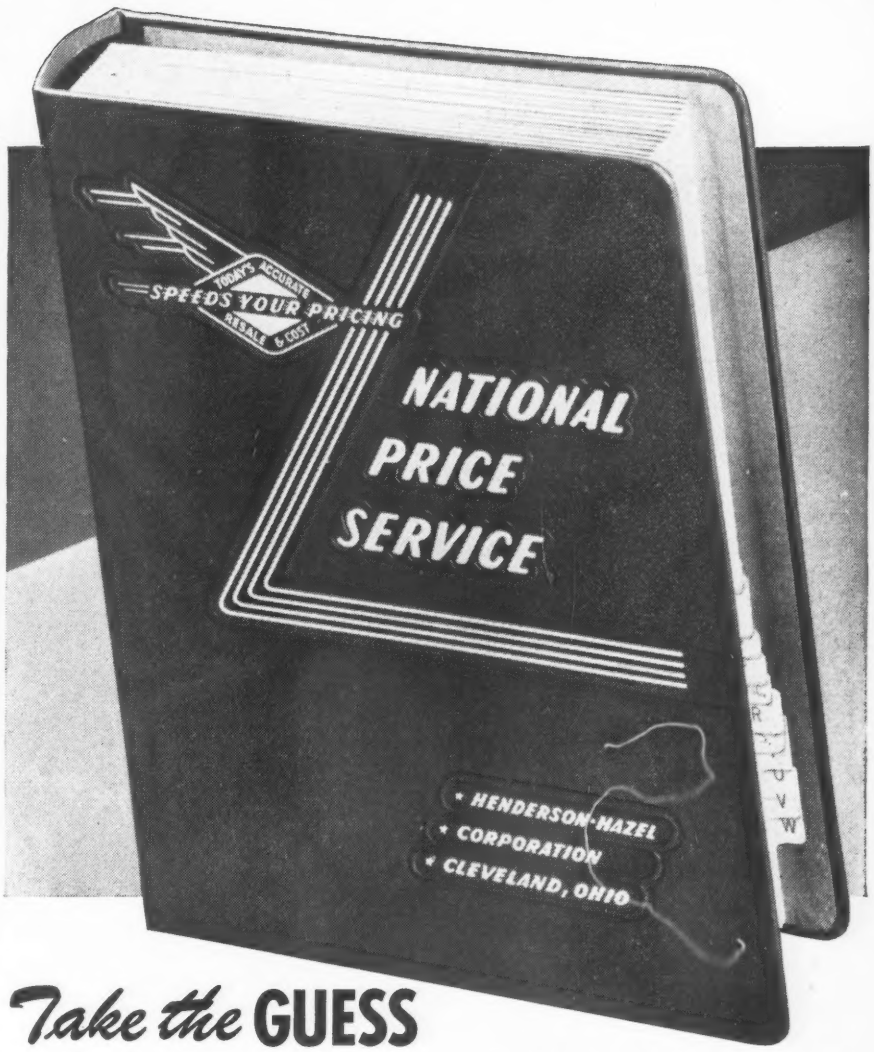

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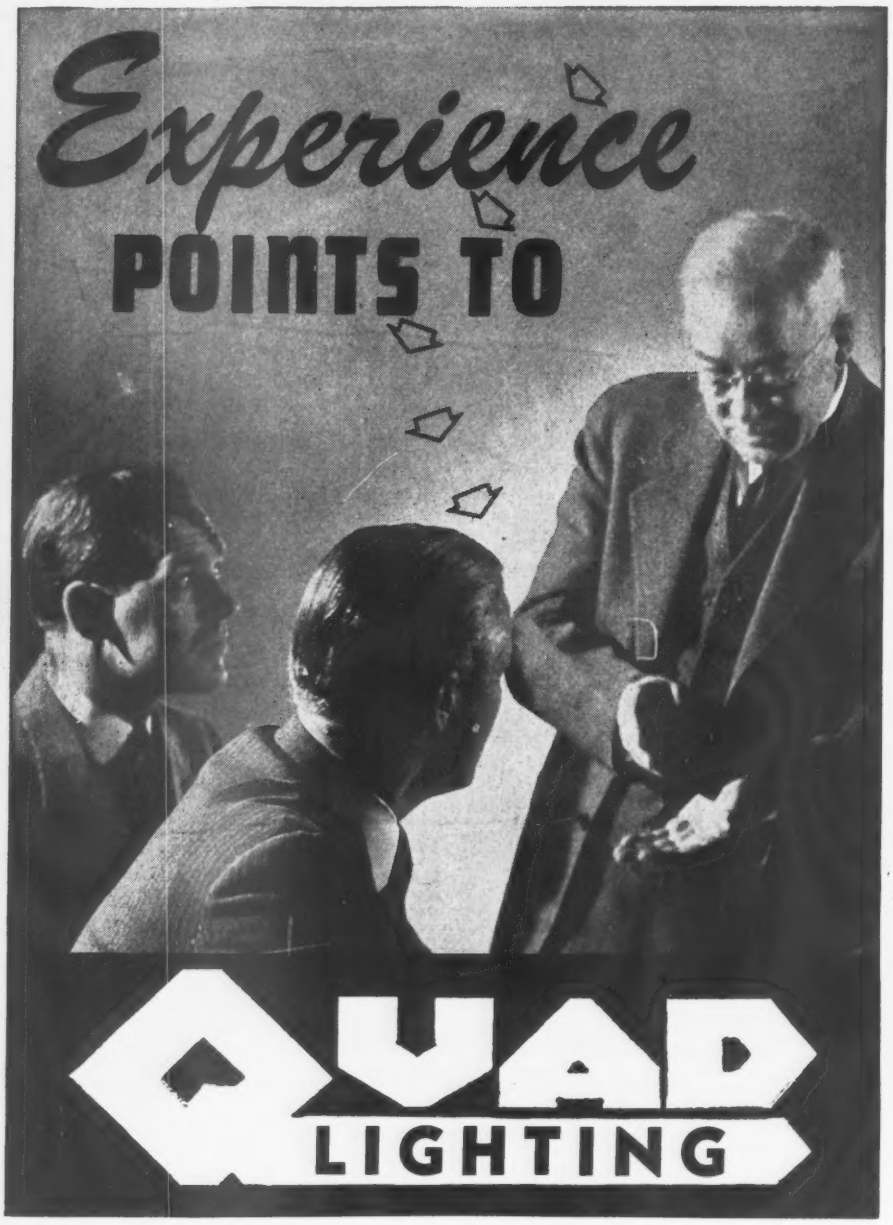

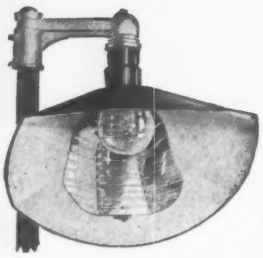

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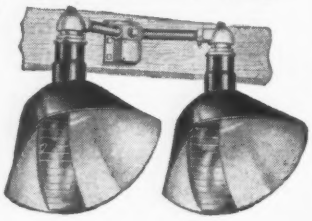

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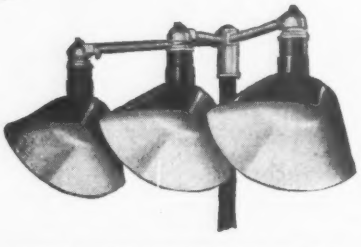

QUADRANGLE MFG. CO. 32 S. PEORIA ST., CHICAGO 7, ILL.

each motor mentioned. Receiving particular attention are such subjects as bearings, commutators, air gaps, adjustments, varnishes and insulation, testing and safety precautions. Numbering 126 pages measuring approximately 5½-by-8½-inches, the book is priced at $2.00 and is published by John Wiley and Sons, Inc., New York City.

Dates Ahead—

Independent Electrical Contractors Association, Inc.—43rd Annual dinner, Hotel Astor, New York, N. Y., January 15, 1949.

American Institute of Electrical Engineers—Winter general meeting, Pennsylvania Hotel, New York, N. Y., January 31-February 4, 1949.

Electrical League of Milwaukee—Annual industry dinner dance, Hotel Schroeder, February 12.

National Electrical Manufacturers Association—Winter convention, Edgewater Beach Hotel, Chicago, Ill., March 13-18, 1949.

Third International Lighting Exposition and Conference—Hotel Stevens, Chicago, Ill., Week of March 28, 1949.

Midwest Power Conference—11th annual conference, Sherman Hotel, Chicago, Ill., April 18-20.

National Electrical Wholesalers Association—41st Annual Convention, Netherland Plaza Hotel, Cincinnati, Ohio, May 1-6.

Chamber of Commerce—37th annual meeting, Washington, D. C., May 2-5.

National Fire Protection Association—53rd annual meeting, Fairmont Hotel, San Francisco, Calif., May 16-19.

National Industrial Service Association—Annual convention, St. Louis, Mo., June 6-8.

Illuminating Engineering Society — National Technical Conference, French Lick, Ind., September 19-23.

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Save time, hard work in tough masonry . . .

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Get Results Like This:

"50 holes—1½ inches deep in tile, per grind. Speed—40 seconds per hole."

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PLASTER, BRICK, TILE, LIMESTONE, CEMENT, are drilled up to 5 times as fast. The Kennadrill stays sharp up to 100 times longer. Blade action ejects the cuttings, prevents binding, sticking. Holes are clean, true, sharp edged. Bits are ¼" to 1½" in diameter. Can be used in hand braces, drill presses, light rotary drills. Write for bulletin EK now.

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Sturdier than ever, the new Frankel ***Flexilug*** is now entirely cadmium plated to prevent corrosion and to enable use with aluminum and steel cables. Patented interlocked construction keeps ***Flexilug*** parts always together . . . no parts to work loose or drop out. Increased contact surfaces give 100% conductivity. Three sizes take all wires from 4/0 stranded to #14 solid. Equally dependable for stranded, flexible or solid wire.

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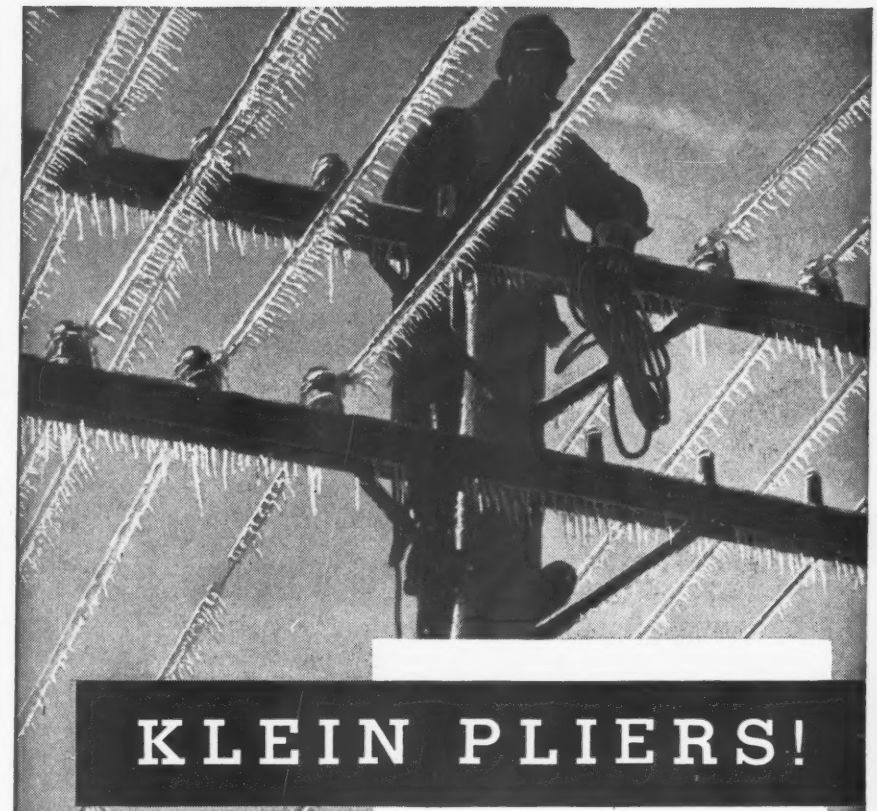

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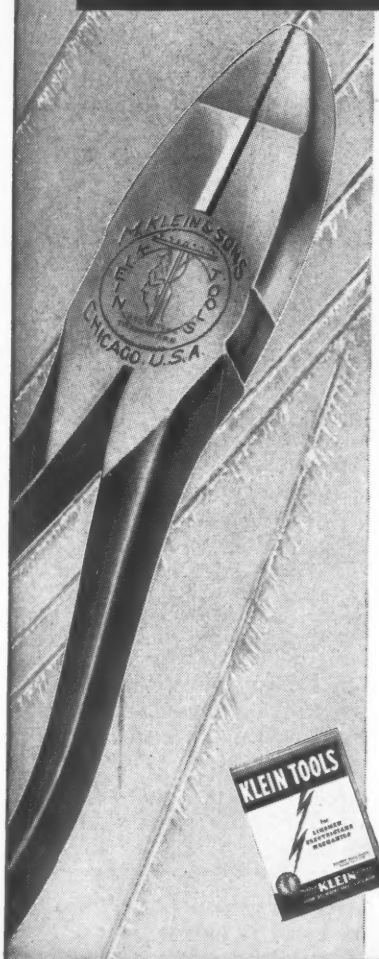

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Wherever there are linemen . . . whatever the job—tough or routine—you'll find Klein Pliers.

There's good reason for this widespread preference that began when the electrical industry was in its infancy and has continued on through the years.

Linemen know they can depend upon the quality and performance of Klein Pliers. Drop forged from the finest alloy steel, each pair is individually tempered and tested—has the proper balance—just the right spring to the handles to minimize hand fatigue. A fitted hinge keeps jaws perfectly aligned—the carefully matched knives cut swiftly, surely and stay keen for years.

The complete Klein line includes pliers for every use. Your supplier will fill your order as quickly as possible.

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A copy of the Klein Pocket Tool Guide, showing the Klein line and containing valuable tool information, will be sent on request.

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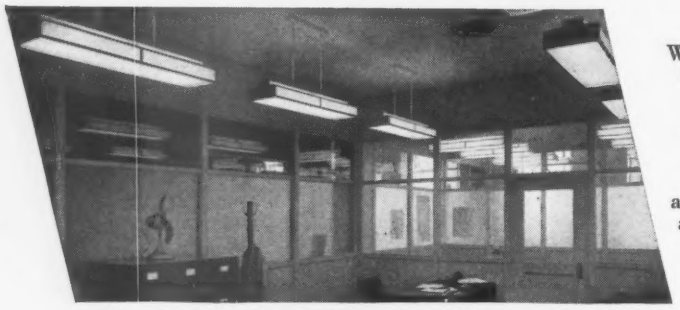
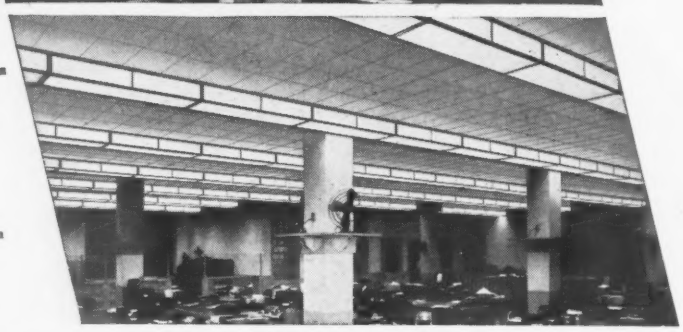


Wiley Fluorescent Fixtures provide custom-made results both in lighting requirements and flexibility of arrangement to fit any architectural plan *without* custom-made costs.

TOP
Wiley Niagara Flur-O-Lier

CENTER
Wiley Recessed Troffers

BOTTOM
Wiley Niagara Beam



● **Individual or continuous runs provide flexibility of arrangement to fit any ceiling light pattern desired.**

Recessed, flush-to-ceiling, or suspended models with louvers or Alba-Lite glass. The new Flur-O-Guide curved lens are available in recessed Troffers. Models to suit any light requirement and decorative motif.

Fluorescent Models are available with 2, 3 or 4-lamp starter or instant start (H. P. F.) and Slimline Models with 2, 4 or 6 lamps in various lengths and milliampere capacities, to permit greater or less light output as required in particular locations—*without change* of fixture style.

Wiley originated the E-Z Servicer feature that permits one man, without tools, to clean and replace lamps in a matter of minutes.

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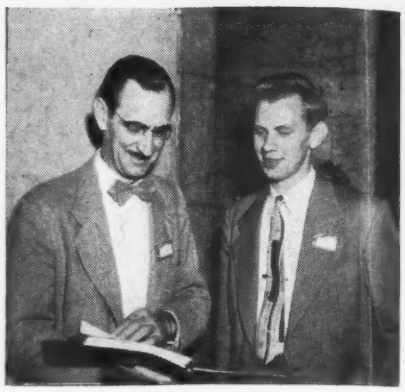


Mass house wiring specialist C. A. Charland (left) of Triple-E Electric Co., Washington, D. C., tells Arnold Heller, assistant manager, Illinois Chapter, NECA, about his work on the Byrne-Peoria project of 600 homes.

Manufacturers News

GENERAL ELECTRIC CHANGES

Fred F. Harroff has been appointed general manager of General Electric's Lamp Department. M. L. Sloan, who has been general manager of the department since 1942, will continue in his capacity as vice president, with offices at the department's headquarters at Nela Park, Cleveland, Ohio.

Mr. Harroff joined G-E at Nela Park in 1920, shortly after being graduated from Western Reserve University. He served in the sales operation division

F. F. HARROFF

for ten years and in 1931 was transferred to the Administration Division. In 1943 he was advanced to assistant general manager of Lamp Department.

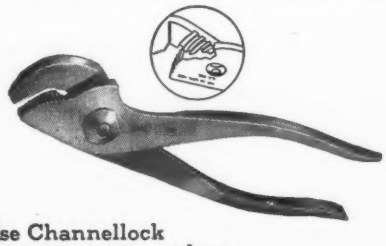
Elmer E. Sheldon has been appointed staff assistant to the manager of manufacturing of the Construction Materials Department, Bridgeport, Conn. Mr. Sheldon, who was formerly quality control engineer of the wire and cable division, joined the company in 1937 and was for many years in test engineering for the wire and cable division.

Appointment of Dr. James R. Donnalley as manager of G-E's silicone manufacturing plant at Waterford, N. Y. has been announced.

Don't say 'PLIERS', say CHANNELLOCK!

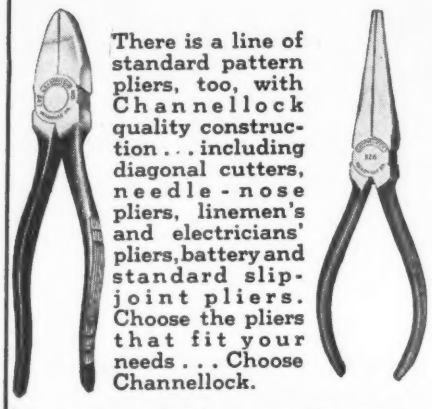
"The name is CHANNELLOCK"

The Channellock pliers with our exclusive tongue and groove joint give more features. Greater Strength — Longer Wearing — Closely Spaced Adjustments — Self Cleaning — Visible Adjustments — No Wear on Joint Bolt.



Use Channellock for your repair needs— electrical, plumbing, ignition, battery, automotive, and aviation work.

Only these pliers incorporate the exclusive Channellock tongue and groove joint.



There is a line of standard pattern pliers, too, with Channellock quality construction . . . including diagonal cutters, needle-nose pliers, linemen's and electricians' pliers, battery and standard slip-joint pliers. Choose the pliers that fit your needs . . . Choose Channellock.

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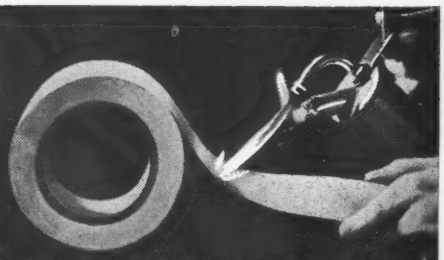
NEW! A Good Transformer MADE BETTER!

MTC uses the new JOHNS-MANVILLE Quinterra insulation throughout its entire line of air-cooled transformers.



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• HEAT-PROOF
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THE MARK OF QUALITY MTC

AIR-COOLED TRANSFORMERS
1 to 1,000 KVA up to 15,000 Volts to meet Individual Requirements

- DISTRIBUTION
- GENERAL PURPOSE
- PHASE CHANGING
- ELECTRIC FURNACE
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- WELDING
- MOTOR STARTING

Insulation determines the working life of an air-cooled transformer. Marcus Transformers have always been known for their use of superior Class B and C heat-proof insulation. In this phase of design, MTC has pioneered many noteworthy firsts. AGAIN, MTC is pioneering in the use of Quinterra throughout its entire line of air-cooled transformers. We invite your inquiry with confidence, knowing that once you have utilized a Marcus air-cooled Transformer, you will specify no other.

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PIONEERS IN THE FIELD OF AIR-COOLED TRANSFORMERS

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New LIGHTWEIGHT ELECTRIC PLANT

5000 WATTS D.C.

Weighs only 315 lbs.!

Model 5CK-115M, 5,000 watts, 115 volts D.C.

Use fast-working electrical tools on any construction or maintenance job with this high capacity, portable, compact electric plant. Equipped with four-receptacle box for direct plug-in of tools or lights. Available with carrying frame, or dolly-mounted. Powered by Onan 10 HP, two-cylinder, 4-cycle, air-cooled engine. Shipped complete . . . ready to go!

NEW ONAN "CK" ELECTRIC PLANTS are available in 5000 watts D.C., 115 and 230 volts; 2000 and 3000 watts A.C. in all standard voltages.
COMPLETE ELECTRIC PLANT LINE INCLUDES: A.C.—350 to 35,000 watts in all standard voltages and frequencies. D.C.—600 to 15,000 watts, 115 and 230 volts. Battery Chargers—500 to 6,000 watts, 6, 12, 24, 32 and 115 volts.
ONAN AIR-COOLED ENGINES—CK: 2-cylinder opposed, 10 HP. BH: 2-cylinder opposed, 5½ HP. IB: 1-cylinder, 3¼ HP.

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HERE'S WHAT YOU'VE BEEN WAITING FOR!

P-182 Converts Your Manually-Operated Hydraulic Systems to Power Operation

Here it is—a new and complete "profit package" for converting your hand-operated Blackhawk Pipe Bender to power operation. This practical conversion adds speed, power and ease to your pipe bender work. It slashes bending time, saves man and muscle power and creates big savings for you.

Handy P-182 is adaptable to any hydraulic system and any job. Its compact "service-proved" design incorporates control valve, motor, pump, and reservoir in *one* package—a "profit package" for you.

A Product of BLACKHAWK MFG. CO., Dept.P-2019, Milwaukee 1, Wis.

You Get These Advantages

EASY TO USE—Simply remove your hand operated pump, connect the hose to the P-182 and you're set to plug it in and go to work anywhere.

SAVES TIME—Effortless to operate—P-182 eliminates slow-downs due to fatigue. It works at top speed all day and, consequently, turns out more work.

SAVES MONEY— P-182 pays for itself in manhours saved alone. On time and material jobs this saving means lower bids, more jobs.

IMPROVED WORK—Fingertip single lever control permits operator to focus attention on job—hands are free to check measurements, etc.

PORTABILITY — Equipped with handle — one man can easily carry P-182 right to job.

INCREASES PRODUCTION — Fast, versatile P-182 handles pipe bending or operates as many as 2 to 25 hydraulic rams simultaneously for other production or maintenance operations.

Ask your Industrial Supply Distributor for full information on the New P-182 or write for bulletin.

Be Sure You Get These "Extras"

Blackhawk Porto-Power Pipe Benders do MORE than bend pipe. Hydraulic ram is detachable for use with P-182 on production and maintenance operations such as pulling pulleys, lifting machinery, etc.

BLACKHAWK

Alexander S. Moody, commercial vice president of the General Electric Company in charge of customer relations work in the Northwestern states with headquarters in Portland, Ore., retired on November 30 after 42 years of service to the company.

ANACONDA CHANGES

L. F. Hickernell as chief engineer will direct the engineering and research policy of the Anaconda Wire & Cable Company and act as consultant to customers as well as executive and manufacturing departments of the company.

He will be aided by L. L. Carter and D. E. Allen as assistant chief engineers both located at Hastings-on-Hudson engineering headquarters.

A. A. Jones is appointed manager engineering department, reporting to Mr. Hickernell. He will be in direct supervision of the engineering and research operations.

C. B. Peck, Jr. has been named assistant manager of industrial sales. He will act as liaison between mills, headquarters, district offices and customers. Mr. Peck will also continue to carry on his function as manager of portable cable sales.

WESTINGHOUSE APPOINTMENTS

The appointment of William A. Beatty as manager of the Feeder Division of the Westinghouse Electric Corp., East Pittsburgh, Pa. has been announced.

Leonard H. Loufek has been named industrial manager of the Central District. He succeeds C. H. Weaver, who has been named manager of the company's newly-formed Atomic Power Division.

NEW LIGHTING COMPANY FORMED

Howard Schumaker and Fred Cramer were elected president and vice president of the Northern Light Company, 2051 N. 19th Street, Milwaukee. Members of the Board, in addition to Schumaker and Cramer, are J. Stewart Murphy, secretary, Clarence Bickel, treasurer and Charles F. Kahn.

The new company will continue the fluorescent lighting fixture manufacturing business of three other Milwaukee firms: Kahn Manufacturing Company, Adjustable Fixture Company, and Fred Cramer Mfg. Co. All equipment and inventory used by these three companies have been acquired by Northern Light. Key personnel has been retained, including Lawrence Kaap, chief engineer, and William Fredericks, plant manager.

heavy duty
CARBON LAMPS

by NALCO

LAST LONGER

Especially Designed for Industrial Use

- Pilot Lights • Test Lamps
- Exit Lights • Signal Lights

Nalco Carbon Lamps are setting records of extra hours of service—wherever they're used—because they're engineered for rugged industrial performance. Actual tests in use prove their long-life superiority where inductive kick-back can feed into the lamp circuit. And where vibrations are constantly incurred, Nalco Carbon Lamps pay for themselves through longer, trouble-free service, fewer bulb replacements.

There's a NALCO Carbon Lamp for Your Every Need:

Standard types, shapes, sizes and colors are available, as well as special shapes, colors and construction features. Standard screw and special bases are supplied according to your needs.

Send for catalog sheets and price lists.

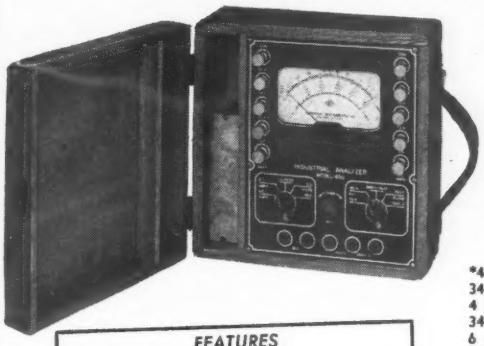
NORTH AMERICAN
Electric Lamp Co.

1044 Tyler St., St. Louis 6, Mo.

THE NEW MODEL 630
INDUSTRIAL ANALYZER

MEASURES:
*A.C. WATTS; D.C. WATTS; A.C. VOLTS; D.C. VOLTS; A.C. CURRENT; D.C. CURRENT; RESISTANCE

*WATT TABLES BASED ON UNITY POWER FACTOR



The new Model 630 provides all the measuring services required for maintenance, development, testing and laboratory work. Latest of a long line of instruments specifically designed to meet the requirements of industry for a unit which will provide a means of accurately making the four basic electrical measurements—VOLTS, OHMS, WATTS AND AMPERES.

FEATURES

★ A SINGLE SCALE is used for all twelve A.C. and D.C. Voltage Ranges.

★ Operates on self-contained standard battery. Always ready for use—no external source of current required.

★ Comes housed in beautiful hand-rubbed oak cabinet. Complete with portable cover. Ideal for use on the bench or in the field.

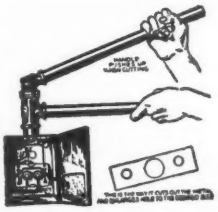
SPECIFICATIONS

*4 A.C. WATTAGE RANGES: 0 to 690/1725/3450/6900 Watts.
4 D.C. WATTAGE RANGES: 0 to 690/1725/3450/6900 Watts.
6 A.C. VOLTAGE RANGES: 0 to 75/150/300/750/1,500/3,000 Volts.
6 D.C. VOLTAGE RANGES: 0 to 75/150/300/750/1,500/3,000 Volts
4 A.C. CURRENT RANGES: 0 to 3/7.5/15/30 Amperes.
4 D.C. CURRENT RANGES: 0 to 3/7.5/15/30 Amperes.
3 RESISTANCE RANGES: 0 to 10,000/100,000 Ohms. 0 to 1 Megohm.
*WATT TABLES BASED ON UNITY POWER FACTOR

Model 630 comes housed in a hand-rubbed oak cabinet complete with cover, self-contained battery, test leads and instructions. Size 9"x10"x5". Only $48.75

SUPERIOR INSTRUMENTS CO.
DEPT. EC-1 227 FULTON STREET
NEW YORK 7, N. Y.

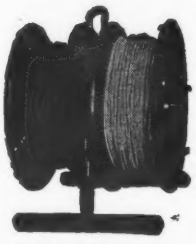
HYKON
Knock-out Trimmer



The modern method of Enlarging Knock-outs.

- A new quick way of enlarging holes. Compact, cuts any size, fits your tool box. Operates from outside or inside of box or cabinet before or after installation. *No extra punches required.* —one tool does the job.

HyKon



HYKON WIRE REELS

Available in 2 diameters for any size wire — in various multiples. Reels wire off top, bottom or from any angle—no kinking — correct tension maintained.

Write for literature.

HyKon Mfg. Co.
ALLIANCE • • • OHIO

MULTI
INDUSTRIAL
LIGHTING EQUIPMENT

STEEL REFLECTORS
Porcelain enamel

OUTDOOR BRACKET FIXTURES
Low-cost unit for utility use

VAPORPROOF Fixture
Dust and Moisture Proof with Dome Reflector

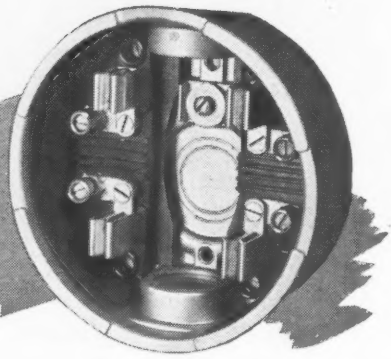
Better Lighting Units mean More Jobs . . . More Money . . . . . .

The trend is toward better looking installations . . . you can get just about any effect you please AND good lighting efficiency too with MULTI Units. Each unit has a specific need and will give a maximum of service with a minimum of maintenance. There's a two-fold advantage in using the MULTI line —good looks—good pay!

MULTI ELECTRICAL MANUFACTURING CO.
4223 W. Lake Street Chicago 24, Illinois

NEW STANDARDIZED DEEP METER SOCKET

Low price plus these advantages...



1. Additional wiring space for more liberally rated conductors
2. Greater ease of connecting larger conductors
3. Increased current-carrying capacity
4. New and improved all-welded, one-piece, stainless steel ring
5. Snap-action, quick-hitch ring that requires no tools for installation
6. Bonderized plus baked-on aluminum paint for increased corrosionresistance and longer life
7. Two-way ($3.00 list) three-way ($3.85 list), subject to change without notice.

This new type R-1 four-terminal standardized socket covers with one catalog item the widest practicable range of applications and ratings for single-phase metering. It reduces the number of items to be stocked, increases interchangeability, and provides for future growth.

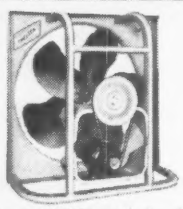
Detailed specifications and prices are available from your nearest G.E. representative. Consult him today, or write for Bulletin GEA-5147. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

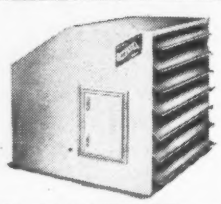
501-42

WORK in Comfort WITH CHELSEA FANS

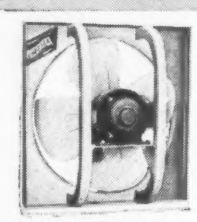
Comfort cool your plant—remove excessive heat, fumes, steam and vapors. Explosion proof motors with non-sparking blades for all popular sizes.



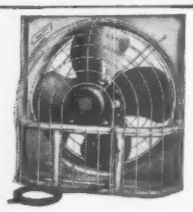
IND — EXHAUST FAN for factories, mills, mines, foundries, auditoriums. Belt drive. Sizes 24 to 60 inches.



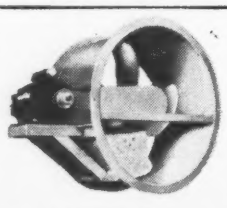
PH — ROOF VENTILATOR complete weather-tight unit for factories, mills. Belt drive. Sizes 24 to 60 inches.



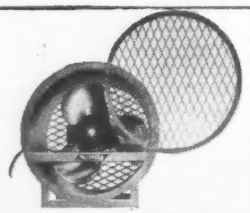
BB—ALL PURPOSE FAN moves large volumes of air. Direct drive. Sizes 12 to 30 inches.



AA—UTILITY FAN for equalizing heat or cold. Direct drive. Guard — front and back. Sizes 20 and 24 inches.



DXB—BOOSTER FAN for paint spray booths and removing fumes and heat. Belt drive. Sizes 16 to 36 inches.



DUB — HEAVY DUTY GENERAL EXHAUSTER. Screened. For steel mills, foundries, shops. Sizes 18 to 30 inches.

Write Dept. **E-4** for industrial Bulletin No. 862 describing fan applications, fan uses and other pertinent information, and for catalog on Industrial Fans.

CHELSEA FAN & BLOWER CO., INC.
1206 GROVE STREET, IRVINGTON, NEW JERSEY

CHELSEA

CHARTER MEMBER OF THE PROPELLER FAN MANUFACTURERS' ASSN.

WESCO CHANGES

Leonard A. Wood has been assigned to the duties of Middle Atlantic District farm sales supervisor for the Westinghouse Electric Supply Company, Philadelphia, Pa.

Thomas H. Davis has been appointed Western district lamp supervisor, with headquarters in Omaha, Nebraska.

Daniel G. Schmidt, Jr. has been named South Atlantic district lamp supervisor of Wesco in Baltimore, Md.

•

Steber Manufacturing Co. of Broadview, Ill. has announced the completion of a new addition to its existing factory that will increase its facilities by a third. This 20,000 foot addition was built to accommodate the moving of the Steber wholly owned subsidiary, the Wolverine Pressed Steel Co. from Grand Haven, Michigan to Broadview.

•

Janette Manufacturing Company, Chicago, Ill., has announced the appointment of the following representatives—Edward W. Weiler will cover the Eastern U. S. Government Bureaus with offices in New York and Washington, D. C.; G. R. Haley as representative for the South Central territory with offices in Dallas, Houston and New Orleans; L. R. Burnester for the San Francisco territory and Harry C. Glaser for the Buffalo territory.

•

Appointment of Robert L. Westbee to head production and distribution of "Scotch" electrical tapes and sound recording tapes has been announced by **Minnesota Mining and Manufacturing Co.,** St. Paul. He will be assisted by Robert B. Holton and Roy J. Gavin.

•

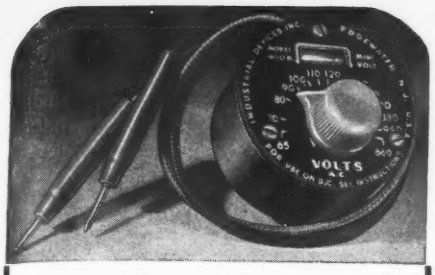
The Art Metal Company, Cleveland, has appointed James M. Hodge as representative for the Chicago territory. In addition to the northern part of the state of Illinois, Mr. Hodge will also cover the southern part of the state of Wisconsin.

•

Clippard Instrument Laboratory, Inc. has announced the appointment of Rocke, Incorporated of 13 E. 40th Street, New York as sales representatives in the metropolitan New York area, northern New Jersey and Connecticut.

•

Robert L. Halsted has been named manager of the **Allis-Chalmers** Cleveland district office, succeeding the late Arthur H. Wyman, James Mathews, Charleston sales representative, succeeds Mr. Halsted as Charleston manager.



MINI-VOLT

Instantly read voltages right off dial. 65 to 660 v. AC. Also DC. Virtually burnout-proof. Guaranteed for 10,000 hours' operation. Plastic case. 12" flexible test leads. *And only $2.75 list!*

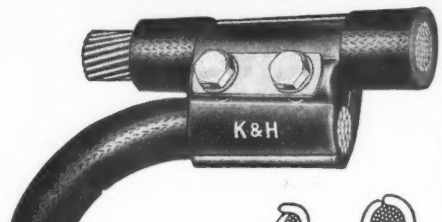
- **Not only distinguishes between 110, 220 etc. volts, but measures line voltage close enough to show up 3 or 4 volt drop between meter and load terminals on 110 v. line.**
- **No electrical worker need now be without definite knowledge of whether faulty operation of motors, or other electrical equipment, etc. is due to improper terminal voltage.**
- **Checks for blown fuses, accidental grounds, circuit continuity. Useful for electrical trouble-shooting in general.**
- **Not subject to error of "False Indication" common to neon test lamps.**

It's a "must." Saves time, money, life and limb! Order from supplier, or from

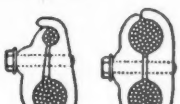
INDUSTRIAL DEVICES, INC.,
EDGEWATER 9, N.J.

K&H Solderless Terminal LUGS — A SIZE and TYPE for every need! — **K&H Solderless CONNECTORS**

UNIVERSAL PARALLEL TAP CONNECTOR



Catalog Nos. 2030 to 2042



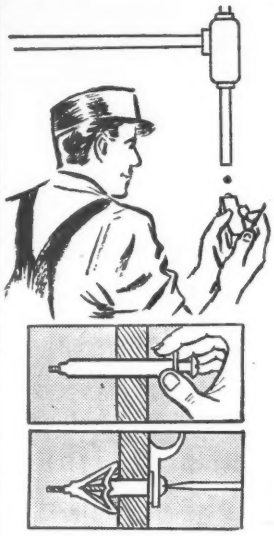
TO CONNECT TWO WIRES VARYING EITHER GREATLY OR SLIGHTLY IN SIZE, OR TWO OF THE SAME SIZE.

The tightening bolts exert an even pressure on both wires regardless of size. The clamping surface is large and covers a contact area several times greater than the cross-section area of the wires themselves. Locking feature insures a permanent connection.

WRITE FOR CATALOG 5LC

KRUEGER & HUDEPOHL
232-8 VINE ST. ★ CINCINNATI 2, OHIO

A NEW AND BETTER WAY TO FASTEN ELECTRICAL EQUIPMENT TO WALLS . . . THE "ANY-WALL" ANCHOR



- **Speeds up installations**
- **Easier, simpler to use**

For hollow or solid walls, the "Any-Wall" Anchor goes in quickly, holds firm and solid on plaster, wood, metal, wallboard, tile, etc. Solves the need for a simple yet dependable fastener for all applications! Tubular steel anchor, length 2½", diameter 5/16". Draws up to dimension of any wall thickness.

1.) **Insert "Any-Wall" Anchor in wall.**
2.) **A few turns of speed tool draws up anchor quickly.**
3.) **Anchor ready for use.**

UNLIMITED USES! Saves you time and labor—when a wall fastening job is needed. Excellent for panel boards, bus ducts, conduit, junction boxes, service switches, strap iron, etc.

SEND FOR THIS SPECIAL INTRODUCTORY KIT OFFER . . .

50 "Any-Wall" Anchors PLUS one $2.50 Speed Tool . . . . . Regular $5.75 Value
YOUR SPECIAL PRICE . . . . $4.95! Postage prepaid.

Prove to yourself that "Any-Wall" Anchors will do a FASTER, NEATER job. SEND FOR YOUR INTRODUCTORY KIT TODAY. Samples on request.

ANCHOR MANUFACTURING CO. 1604 LOCUST ST. LOUIS 3, MO.

THE MAGNO-TRONIC FLUORESCENT STARTER

PROTECTS — Fully, automatic thermal relay with unusually long life that eliminates blinking lights and protects all auxiliary equipment.

SIMPLIFIES — Replacement of worn-out lamp automatically restores closed circuit—replacement of starter unnecessary. No button to push.

REDUCES COSTS — Magno-Tronic starters provide exact timing in the lamp electrode—preheating process preventing excessive loss of emission material, thereby assuring the maximum in the useful life of a lamp. The established quality of this starter saves considerable time in maintenance and man hours required to repair and/or replace an inoperative lighting unit.

VERSATILE — Will operate efficiently over an extended voltage range under widely varying temperatures.

GUARANTEED FOR ONE YEAR.

The (SP-15-20) for use with either 15 or 20 watt lamps
The (SP-30-40) for use with either 30 or 40 watt lamps
The (SP-100) for use with 100 watt lamps

Ask for descriptive literature

INDUSTRIAL ELECTRONICS CORP.
MAIN PLANT Newark 2, N. J.

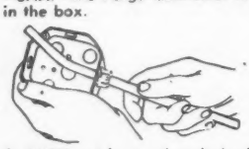
A Press!
A Snap!
A Push!

THE PAIGE #52 CONNECTOR is Installed

IT'S NEW! IT'S DIFFERENT!

FOR NON-METALLIC SHEATHED CABLE

1. PRESS with your thumb and —SNAP—the Paige Connector is in the box.



2. PUSH cable to the desired length. No lock nuts or screws —No special tools. That's all there is to it!

The new PAIGE #52 CONNECTOR brings you great savings in time and money Sturdily made of high grade spring steel, plated against corrosion. Complete installation takes only 7 seconds. Approved by Underwriters' Laboratories Ideal for strain relief

Ask your local jobber or write

Allied 1 N. LaSalle St., Dept. A, Chicago 2, Ill.

ELECTRICAL MANUFACTURING CORP.

Speeds ELECTRICAL ASSEMBLY

PROTECTION
FLEXIBILITY
SMOOTH BORE
GOOD PUSH-BACK
NO FRAYING

DIEFLEX
VARNISHED TUBING PRODUCTS

Dieflex Varnished Tubings and Saturated Sleevings are completely impregnated and have high dielectric strength. They are used by leading manufacturers and rebuilders from coast to coast. Available in grades, sizes, and colors for every application. Samples on request—write today.

INSULATION MANUFACTURERS CORPORATION
565 West Washington Boulevard
Chicago 6, Illinois

ELECTRICAL INSULATION

Offices and Distributors in principal cities

Cannon Electric Development Company of Los Angeles has named Leroy W. Beier as manufacturers representative in the Chicago trading area, including northern Indiana counties, northern Illinois, and eastern Iowa. Mr. Beier's offices are at 600 South Michigan Avenue, Chicago.

•

Curtis Lighting, Inc. has announced the appointment of George Gilleard to the position of assistant chief engineer.

•

Day-Brite Lighting, Inc. of St. Louis, Mo. has announced the appointment of Mathew A. Cabot as southern California representative with headquarters in Van Nuys, Calif.

•

Russell L. Jessee has been appointed Central States sales manager for **Gedney Electrical Company** with headquarters in Chicago, Ill.

•

Claude M. Lamb has been appointed to the new position of sales manager, Industrial V-Belt Division, and assistant to vice president in charge of mechanical sales of the **Dayton Rubber Company,** Dayton, Ohio.

R. S. Gove has been named to succeed Mr. Lamb as New York district sales manager.

•

Alice Honore Drew has been appointed advertising manager of **Duro-Test Corporation.** She was formerly advertising director of Holtzer-Cabot Motors, Boston.

•

Carl Glatthar, president of the **Glatthar Lighting Co.,** Cleveland, Ohio, has announced the purchase of the entire fixture division of **Fuhry & Sons Co.**

•

Cornell-Dubilier Electric Corporation of South Plainfield, N. J. has purchased the **Faradon Capacitor Division** of the Radio Corporation of America, according to an announcement from Octave Blake, president.

•

The E. G. Norton Company, 131 Clarendon Street, Boston, Mass. has been appointed New England representative for the **Standard Transformer Company** of Warren, Ohio.

H. G. Johnson, who formerly represented Standard, has resigned in order to assume the duties of New England manager for the I-TE Circuit Breaker and Railway and Industrial Engineering Companies.

MINERALLAC
Perforated
STRAP
Versatile Hanger Iron

Safely supports hanging pipes, conduits and cables up to 500 lbs. Made of ⅜-in. 18 gauge electro-galvanized steel (also available in Everdur, copper, brass or aluminum). Precision made — perforations do not vary. ¾-in. holes on ½-in. centers. Comes in 10-ft. coils and 5 and 10-ft. straight lengths. Available in other lengths also.

Send for literature and prices

Specify **MINERALLAC**
HANGERS, CLIPS,
STRAPS, BUSHINGS

MINERALLAC ELECTRIC COMPANY
23 North Peoria Street
Chicago 7, Illinois

MINERALLAC

WANTED: ELECTRICAL CONTRACTORS

WHO SPECIALIZE IN *NEW HOME* WIRING...

To handle a product that automatically can be figured in on every NEW HOME WIRING job...

EVERLITE

HOUSE NUMBER ILLUMINATOR

Made of cast aluminum . . . so durable and simple in construction it can't get out of order. It operates on the doorbell transformer at an electricity cost of only 2c per week. Approximately 5,000 have already been sold in Milwaukee by only a few outlets. Recommended and boosted by electric leagues and electric companies.

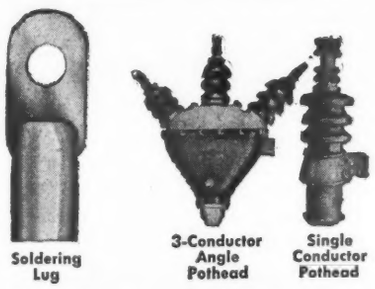
It's a natural for electrical contractors who specialize in new home wiring. Experience shows it can be figured in on every job, and it is proving to be a fine goodwill builder besides. One contractor is figuring it in on 400 new home jobs this year.

WRITE FOR OUR SPECIAL SALES PLAN
EVERLITE DIV., DEPT. E-1

CURTIS DEVELOPMENT & MFG. CO.

Manufacturers of well-known line of Curtis Terminal Blocks
3266 N. 33rd Street, Milwaukee 10, Wisconsin

ELECTRICAL SPECIALTIES
FOR HEAVY INDUSTRIAL SERVICE
RMC
FROM STOCK

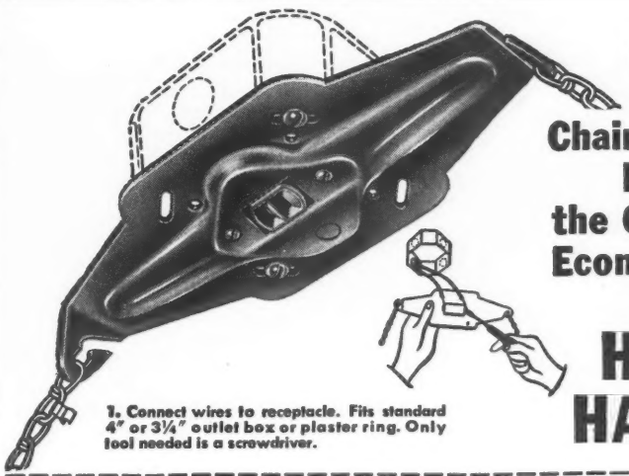


Write for a complete selection of RUSGREEN bulletins

ENDULATORS (POTHEADS) ALL SIZES • ALL SHAPES • ALL VOLTAGES • ALL TYPES • BUS SUPPORTS • SPLICING KITS AND MATERIALS • INSULATING COMPOUNDS

★ ★ ★

RUSGREEN MFG. CO.
14260 Birwood Avenue • Detroit, Mich.

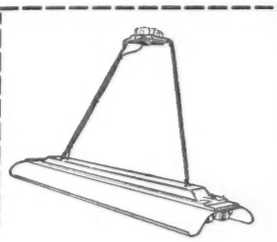


How to Hang Chain Suspended Fixtures the Quick, Easy, Economical Way with HYDEE HANGER*

1. Connect wires to receptacle. Fits standard 4" or 3¼" outlet box or plaster ring. Only tool needed is a screwdriver.

2. Screw hanger to outlet box—only two screws needed. No centering, no punching, no drilling.

3. Hang the fixture and just plug it in. That's all! Self-grounding—regular 2-wire cord and plug may be used.



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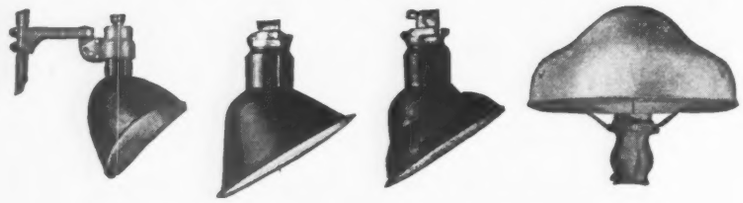

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NECA CONVENTION REPORT

[FROM PAGE 53]

ences in holding the organization together. During the grave responsibilities of the months before the war, his efforts were largely responsible for bringing an organized efficient and effective electrical contracting industry into the service of the nation.

"For his contributions of leadership, vision and constructive service to the electrical contracting industry, the Committee of Awards on the recommendation of the judges has awarded to Mr. Davis the 1948 Contractors Medal and Purse given under the James H. McGraw Award."

The panel of judges who recommended Mr. Davis for this honor consisted of: H. B. Frazer, H. B. Frazer & Company, Philadelphia, Pa.; A. Lincoln Bush, Belmont Electric Company, Inc., New York City; A. H. Wilson, Electrical Construction Company, Inc., Washington, D. C.; W. J. Wheeler, Mainco Contracting Corp., New York City; and W. T. Stuart, secretary Committee of Awards.

The first NECA National Apprenticeship Award was presented at the banquet by E. H. Herzberg, Chairman of the National Joint Committee on Apprenticeship and Training. Recipient of the gold medal, purse, and convention trip was 32-year old Robert M. Hutchison, a Navy Seabee veteran of Evansville, Indiana. Hutchison took top honors in the local contest; copped the District Four contest; and went on to win over nationwide competition.

From 1936 until he entered the Navy, Mr. Hutchison worked for electrical wholesale firms. While in the Seabees, he designed and built a magnetic road sweeper. He was indentured as an apprentice in March 1946 and completed his course in February 1948, having received credit for previous accredited training. His present employer, the Althoff-Howard Electric Company at Evansville, believes he possesses the leadership and qualifications for a future key supervisory assignment.

Business Sessions

The pattern of NECA's progress as an organization was indicated in reports presented by executive vice-president Paul M. Geary, secretary Clint J. Harder and retiring treasurer L. W. Davis.

From a membership of 883 at the beginning of 1941, NECA has increased its roster to 2693 as of Nov. 30, 1948. There are now 74 Chapters in all parts of the country and a headquarters staff of 27 in Washington.

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FOR SECURE FASTENING

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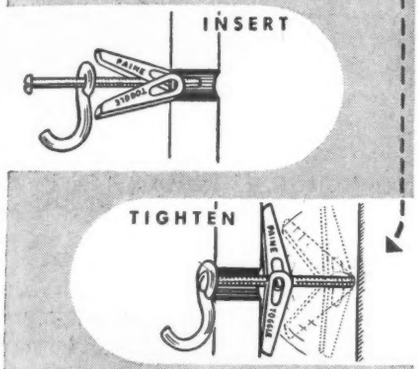

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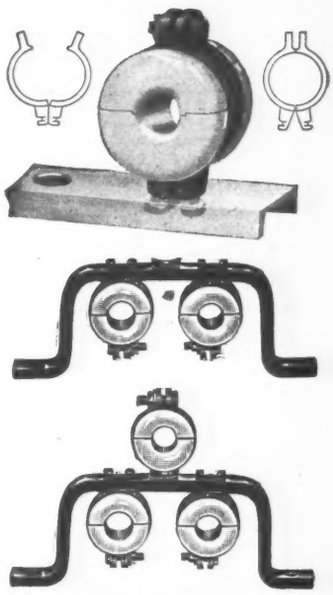
Install cable quickly, easily and safely with... "Efficiency" NESTED CONDUCTOR RACKS



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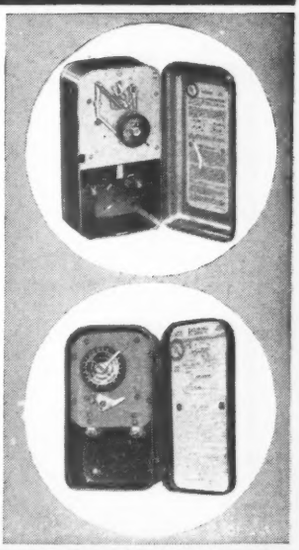

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NECA plans to establish and maintain an active Chapter or division of a Chapter for each of the 400 recognized local trading or wage areas in the United States. Today about 275 of these areas are covered. A west coast office will be opened soon. Provisions have been made to set up "Special Benefit Activity Sections"—such as the Line Constructors Division—to benefit members engaged in specialized activities.

NECA's government Relations Department has advised members about Government contracting procedure, tax laws, the Fair Labor Standards Act, the Labor-Management act of 1947, the Federal Anti-Trust Laws and other factors influencing the electrical contractors' business operations.

In his report, Mr. Geary credited much of NECA's growth and progress during the past ten years to the work of the Labor Relations Section; revealed that the Apprenticeship and Training program is in full swing; noted that The Council on Industrial Relations rendered decisions in 27 arbitration cases during the past year; reported progress in the Employees Benefit Program, Supplier Relations and Competitive Relations activities.

Amplifying the progress of the Apprenticeship and Training program Chairman E. H. Herzberg noted that local joint A and T Committees grew from 48 in 1942 to 407 in 1948 with 18,896 apprentices now under the program. The Industry goal is 500 local committees. Mr. Herzberg urged the industry to resist attempts to inject state controls over apprenticeship programs (such laws now enacted in 20 states and the District of Columbia). State and Federal Bureaus should act as consultants only, he asserted. Herzberg revealed that the National Committee has drafted and approved a State Apprenticeship Bill in which local committees are given sole and final responsibility for operation and control of their programs. To cope with "fly-by-night" vocational and training schools catering to veterans, he urged state authorities to refuse to certify schools not offering bona fide training.

The National Electrical Benefit Fund (NECA-IBEW), in operation since May 5, 1947, has progressed far beyond expectations, reported executive secretary-treasurer, Laurence W. Davis. Over 8,400 electrical contractors have paid one percent payroll assessments and this number is increasing at the rate of 200 accounts monthly. Compared to an original goal of about 9,000 contractors, the

NO-KINK FISH TAPE

Pushes and pulls around four 90° bends in aluminum conduit and six in steel with ease. Rust proof aircraft control type cable, coil spring covered, will not kink, break or gouge. Slips past boxes and conduit ends no curling—requires fewer boxes and fittings. Lengths 25—50—100 feet.

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"Jiffy" Knockout Seals are safe, cost less, and are easy to install. Only one piece, they snap into place. No tools are necessary.

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total will approximate 11,000, Davis stated.

Total income for the Benefit Fund from employers is now $3,600,000 annually, representing one percent assessments on $360 million of payrolls. Funds collected by the National Employees Benefit Board are paid over quarterly to a joint Board of Trustees, who hold such funds in a separate trust to pay pensions to qualified IBEW members. Of the 7,400 contractors who filed weekly payroll report forms in October, 6,171 averaged from one to 15 employees, Mr. Davis added.

NECA is now an incorporated organization. Formal steps were taken at the convention to affect this change. The move was made to limit the civil liability of members; to permit the association to buy, own and sell real property; to increase the capacity of the Association to act for its Chapters and members; to protect the name of the association; and to limit more effectively in civil cases the agency relationship between the National and its Chapters and between Chapters to authorized acts.

The convention approved the Board of Governors recommendation to establish a new District 8 to cover Colorado, Wyoming, Utah, Idaho and Montana. J. E. Collier of Denver, Colorado was elected as vice-president to represent this new district.

Other vice-presidents elected at the conference were: District 5—James L. McClure, McClure Electric Co., Dallas, Texas; District 6—J. B. Shamel, California Electric & Maintenance Co., Los Angeles, Calif.; District 7—S. C. Dodson, Dodson Engineering Co., Omaha, Nebraska.

At the concluding open session of the convention, Scott Milne, International Secretary, International Brotherhood of Electrical Workers, urged NECA to make a determined effort to secure line construction work—much of which is now being done by general contracting organizations; asked for patience in understanding linemen's temperment and problems. Contractors have a joint responsibility with the IBEW in training men, Milne asserted, noting that there are still some Chapters and locals not interested in this activity. Milne admitted that some IBEW Locals are pretty hide-bound, but added that some NECA Chapters are just as guilty of this temperament..

Mr. Milne tabbed the Employees Benefit Plan one of NECA's most outstanding accomplishments; revealed that its success has far exceeded IBEW's expectations.

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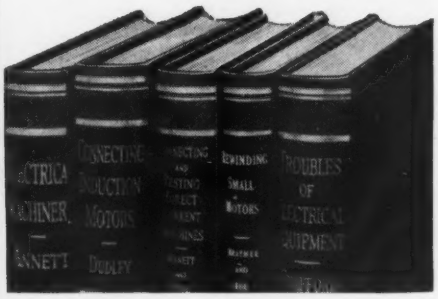
Start now to earn the bigger pay in electrical repair



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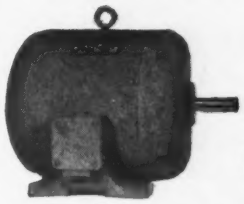

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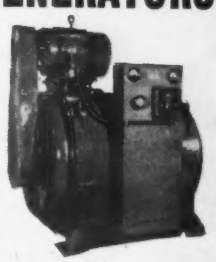

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INTERCOMMUNICATING TELEPHONE LAYOUT

[FROM PAGE 58]

each floor where telephones are located. Since the same number of conductors are installed throughout, the same number of terminals and the same size of cabinets may be used on each floor. Junction or pull boxes P1 to P5 inclusive will contain twenty-two conductors and should have eleven pair of terminals (1–11 pair strip). However, since the ultimate capacity of the instruments will permit the installation of three additional telephones, it is suggested that provision be made for a total of 25 wires requiring 14 pair terminals (2–7 pair strips).

The number of wires between all points are shown in Fig. 6. It is based upon the wiring diagram in Fig. 5. The use of cable is suggested for the same reasons outlined previously. The cable is of the braided type assuming that all locations are dry, however, occasionally some localities such as the basement may be found to be damp or wet in which case lead-covered cable must be used, and the size of the conduit increased accordingly. The cable would be composed of two pairs No. 18 B & S gauge wire and the balance paired No. 22 B & S gauge wire. Cables composed of single No. 22 wires may be used, however, the twisted type has been found the most satisfactory in this type of system. The heavier wires are used to carry the talking and ringing current, while the lighter wires are used as the sections. Spare wires should be included to provide for expansion.

The wire connection charts should be made up for this system as outlined in Figure 4, and modified to meet the conditions. As an example, terminal posts 1 and 2 may be used for the ringing current, terminal posts 3 and 4 may be used for the talking current, terminals 5 to 22 inclusive for the section wires used in the proposed system with terminals 23 to 25 for future expansion.

The size of conduits is based upon the same facts as previously outlined for consideration in the apartment house system.

The power supply unit may be located in the basement where shown if the runs are not too great. However, it is preferable to locate it on the second floor since this would be approximately in the center of the load. This type of system requires six volts for talking as is the case with non-loudspeaking type systems.

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EASY TO WIRE
EASY TO INSTALL!
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750—1000—1500 Watt Enclosed Floods. Ingeniously designed for maximum light output.

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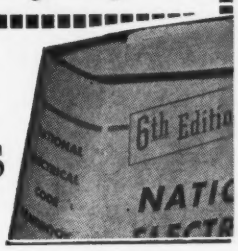

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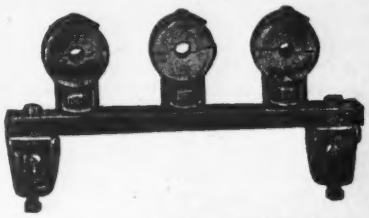

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"Give us the tools . . ."

What Are *YOUR* Chances If There Are No Profits?

Since the November 2 election there has been a dazzling variety of plans to have the government do more and more things and spend more and more money. But there is almost no variety in the plans which are suggested to raise the money.

"Pay for it by taxing profits," is the standard refrain. Slap on an "excess" profits tax. Boost the corporations' income tax rate.

Well – why not? Haven't the corporations been making so much money that a big chunk of it can be turned over to the government spenders without hurting anybody?

The answer is no!

How high profits should be can be debated endlessly. Some people claim that 1948 corporation profits, which will amount to about $20 billion, are too high. They emphasize the fact that profits are larger in relation to investment than they were a few years ago. Other people think profits are low. They stress the fact that profits are not much larger in relation to sales than they have been historically. Both sides agree that in some individual cases profits have been too high, as in others they have been too low or non-existent.

But if we cut the total volume of profits drastically, we shall do so at our national peril.

There is no room for debate about that. For we shall choke off the crucially important job of building new plants and equipment for our industries. Squeeze hard enough, and America will go the way of Britain – down the long and painful skids of industrial decline. Widespread unemployment, especially among our industrial workers who produce new plants and equipment, will mark the dreary way. Here is a fact which the President, the Congress, the C.I.O., and all of us have a real reason to remember:

Almost two-thirds of all profits today are going to rebuild and improve plants and equipment.

More than $13 billion of this year's profits are being plowed back. They are going – as a large proportion of profits have always gone – to buy for workers better tools to work with, better surroundings in which to work. They are making possible better products, and more of them, for all of us.

The figures below show how companies have put more and more profit-dollars and a larger share of their profits to work in the business:

YEAR	PROFITS REINVESTED	% OF TOTAL PROFITS
1929	$2.6 billion	31%
1939	1.2 "	24%
1943	5.9 "	57%
1944	5.2 "	53%
1945	4.2 "	47%
1946	6.9 "	55%
1947	11.2 "	62%
1948 est.	13.0 "	65%

continued on next page

The record shows that each of us is the real beneficiary of this plowing back of profits.

Every American has benefited from these profits. Each dollar that business has put into its plants and equipment in the last thirty years has increased our yearly production by 35 cents.

This re-investment of profits has helped make possible a 75% increase in living standards since 1919.

It has helped increase wages from an average 48 cents an hour in 1919 to $1.36 today. Allowing for higher prices, that increase means that an hour's work today will buy twice as much as it did thirty years ago.

Why must business retain these billions of profits to improve its plants and equipment? Why must it plow back more and more? *The reason is that business already is caught in a tax squeeze.*

Federal taxes alone take at least thirty-eight of each one hundred dollars a company earns. Then, if the company pays out to its stockholders any part of what is left as dividends, the federal personal income taxes of the stockholders may take up to 77% of those dividends. Under these conditions, so few people are willing to invest in industry that the stock market is stagnant. Companies can not raise in that market the money they need for improvements.

The result: business must rely more and more on plowed-back profits to pay for new plants and equipment.

We know that everywhere in industry new and better ways of producing goods are standing ready for use. The previous editorial in this series mentioned some of them. We know, too, that depression and war put our industries far behind schedule – as much as $100 billion behind – in getting the new tools they should have had to keep themselves in first-class shape. McGraw-Hill is now completing a survey of industry that will measure these needs. The results will be published in this editorial series. We know already that in 1949 alone industry will need $18 billion or more for this purpose.

And all but a small fraction of that sum must come from profits.

Our prosperity, our strength as a nation, our hopes for better living depend on our continuing to generate and to plow back a large volume of profits.

For that reason we should not thoughtlessly follow these people who propose to pay for any and all new government activities by saying simply, "Soak the corporations." There is no need to follow them. There are other ways of obtaining necessary funds.

First and foremost should be economy within the government itself. If its citizens must pay still higher taxes, then surely government should exercise rigid self-restraint, cutting out all but the most essential activities and expenses.

After economy should come consideration of a broader federal tax base.

If these and other methods of raising money are inadequate and if taxes must take a bigger bite from business profits, two facts are clear. We should not adopt an "excess" profits tax with all of its complications and all of its corrupting effect on business. A moderate increase in the regular income tax on corporations is much less dangerous. *But even such an increase, if necessary, should be accompanied by special allowances for expansion and depreciation that will encourage companies to continue spending their earnings for new plant and equipment.* We all have a stake in that.

At this critical juncture in our history profits have a new and vastly more important role than they have ever had. In unprecedented degree they are the drive behind our present prosperity and the key to a better, stronger future.

Give profits the axe and the blow does not stop there.

It cuts into the employment, the prosperity and the strength of our nation.

Everyone of us has a stake in how the President and Congress handle taxes on profits – and now is the time to remind them of that stake.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.